DOCUMENT RESUME

ED 053 443 EA 003 568

AUTHOR	Hallak, Jacques, Comp.
TITLE	Educational Costs and Productivity.
INSTITUTION	United Nations Educational, Scientific, and Cultural Organization, Paris (France). International Inst. for Educational Planning.
PUB DATE	Dec 67
NOTE	288p.; Contributions to a seminar held at IIEP, 5-16 June 1967
AVAILABLE FROM	International Institute for Educational Planning, 9, rue Eugene-Delacroix, Paris 16e, France
EDRS PRICE	EDRS Price MF-$0.65 HC-$9.87
DESCRIPTORS	*Cost Effectiveness, Costs, Decision Making, Developed Nations, Developing Nations, Economic Factors, *Educational Economics, *Educational Planning, *Management Systems, *Productivity
IDENTIFIERS	Economic Planning

ABSTRACT

This seminar focused on costs and productivity as they are defined within both education and economics. Some topics that received special attention were: definition problems, estimating methods, analysis methods, existing research results, and examples of improvement in educational efficiency. The document groups seminar papers under (1) general concepts and definitions, (2) methodology of unit costs and problems related to measurement of the educational product, (3) special cases of educational productivity and output measurement, and (4) practical methods for improving efficiency in education. (Author/EA)

ED053443

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

EDUCATIONAL COSTS AND PRODUCTIVITY

Contributions to a seminar for professors of educational
planning (economics) of the regional centres
of Unesco, held at the International Institute
for Educational Planning. 5-16 June 1967

Selected by Jacques Hallak

EA 003 568

Unesco : International Institute for
Educational Planning

Produced and printed in France by the
International Institute for Educational Planning
7 rue Eugène-Delacroix, 75 Paris - 16ème
December 1967

INTRODUCTION

After more than a decade of extraordinary expansion, educational systems throughout the world, but especially those in developing countries, are encountering a period of unusually heavy financial weather. The reason is not hard to find. Education budgets in many countries have more than doubled in the past 10 to 15 years. Equally significant, the percentage shares of the GNP and of total public revenues devoted to education have also risen sharply. In a good number of developing countries, for example, educational outlays have increased from 2 per cent or less of the GNP 10 years or so ago to 4 per cent or more now, and from under 10 per cent of total government expenditures to over 20 per cent. These percentages obviously cannot continue to rise at this rate indefinitely, because of other important claims on scarce national resources - such as agricultural and industrial development, health and housing, and, unfortunately, police and military requirements. In fact, this percentage curve has already begun to flatten - or has stopped rising altogether - in many countries. It must be expected, therefore, that annual increments to education budgets will tend to be smaller in the future than in the recent past - despite the fact that the need for further educational expansion, and particularly for extensive adaptation and improvement, will continue to grow apace.

Faced with the dilemma of this widening gap between resources and requirements, educational leaders will need to work harder than ever to find additional revenues. What is even more important, they will need to give unprecedented attention to getting more educational results, and better quality results, from the resources already available. In short, the improvement of internal efficiency, and of external productivity has become a matter of urgent necessity for educational systems everywhere.

To cope with this situation, educational managers and planners will need the help of improved analytical tools and of fuller information about their educational systems. With a view to bringing this imperative need into clearer focus, and to encouraging a more concerted attack on the problems of educational efficiency and productivity, the International Institute for Educational Planning - as part of its research and training programme - organized a special two-week seminar on these matters, in Paris in June 1967. This seminar was attended by economists, educators, and professors of educational planning from Unesco-sponsored regional training centres, and from several universities and other research and training organizations.1/ The first week was devoted to studying the appropriate economic content of training programmes for educational planners.2/ During the second week the participants examined problems of educational cost analysis, efficiency and productivity. This present report deals with the subject matter of the second week.

The seminar was organized on behalf of the Institute by Mr. Jacques Hallak, an IIEP Staff Member, who also contributed the keynote discussion paper which is reproduced here, and served as editor of this collection of papers. Several other participants also prepared papers which contributed much to the seminar discussions. These papers are reproduced here, with the authors' consent, in order to make them available to a wider audience. Since a number of them may later be formally published, they should meanwhile not be reproduced in whole or in part without the author's written consent.

1/ See list of participants in the Annex.

2/ The proceedings of the seminar during the first week is dealt with in: Hallak, J.: Report of the Seminar for Professors of Educational Planning (Economic Aspects), IIEP, mimeographed document IIEP/S13/7, 1967.

It is not feasible to present a full summary here of the wide-ranging discussions of the seminar. But it may be useful to call attention to the following points that received attention:

Problems of definition: such terms and concepts as systems analysis, internal efficiency and external productivity, factor productivity, costs, expenditures, indicators of quality, objective and subjective measures of output, optimum combination of components in the educational process, improved utilization of educational resources.

Methods of estimating: such items as educational investments, the cost of "repeaters" and "drop-outs", educational inputs and outputs, unit costs, teacher productivity, space utilization.

Methods of analysis: concerning such matters as efficiency and productivity, cost per student enrolled vs. cost per graduate, cost/quality ratio, unit cost "norms", unit costs in the framework of systems analysis, efficiency and productivity of part-time and non-formal education; problems requiring an inter-disciplinary approach.

Existing research results: on topics such as equality of educational opportunity (the Coleman Report); educational productivity trends in the United Kingdom; factor analysis of qualification levels for admission to universities, etc.; rates of failure in examinations in Cameroon and Senegal; teacher salary trends in developing countries.

Examples of improvement in educational efficiency: standardization of school design and construction (e.g. United Kingdom); more intensive utilization of facilities; use of teacher-aides and team teaching; more emphasis on self-learning through programmed instruction, etc.; use of new media; regrouping of students by subject and achievement level; multi-purpose classrooms and school buildings; efficiencies in procurement, school feeding programmes, transport; rational location of school facilities and minimum efficient size of units.

The papers contained in this document touch upon many of the topics listed above. They are divided into four sections:

Section 1: General concepts and definitions

Section 2: Methodology of unit costs, and problems related to the measurement of the product of education

Section 3: Special cases of educational productivity and output measurement

Section 4: Practical methods for improving efficiency in education

The Institute expresses its appreciation to all those who participated in the special seminar, and especially to the authors whose papers are reproduced here. The views expressed in these papers are, of course, those of the individual authors and do not commit the Institute or Unesco.

Philip H. Coombs
Director IIEP

Contents

A. General concepts and definitions

I. Efficiency in education
by J. Hallak

II. Rendement et productivité de l'enseignement
by Lê Thành Khôi

III. Guide for a financial analysis of the educational system
by Fernando de Escondrillas

B. Methodologies

IV. Unit cost concepts and statistics required for an analysis of educational productivity
by Jean-Pierre Gern

V. Problems of measuring educational yield in order to assess educational productivity
by N. Bodart

C. Case Studies

VI. Productivity trends in British secondary education, 1950-1963
by M. Woodhall

VII. Analyse combinée de rendement et de coût
(with summary in English)
by Nguyen Huu Chau

D. Concrete Examples

VIII. Areas for improved efficiency in educational systems
by J. Hallak

IX. Productivity and the teacher
by J.D. Chesswas

X. La rationalisation et la normalisation des programmes de construction des écoles et des techniques de construction
by R. Poignant

XI. Educational architecture *v.* educational change
by J. Beynon

List of participants

PART A GENERAL CONCEPTS AND DEFINITIONS

EFFICIENCY IN EDUCATION

by J. Hallak

CONTENTS

Pages

PREFACE I - (ii)

INTRODUCTION I - 1

I. DEFINITIONS I - 3

  1. The concepts used in economics I - 3

  2. The concepts as used in education I - 6

  3. Educational products and factors I - 8

II. METHODS I - 13

A. EVALUATION METHODS I - 13

  1. The measurement of productivity I - 13

  2. Measurement of yield and efficiency indices I - 18

B. ANALYTICAL METHODS I - 20

  1. General remarks I - 20

  2. The principle and the methods I - 20

  3. Difficulties of application in education I - 24

SUMMARY I - 28

ANNEX A - CHAPTER II I - 29

ANNEX B - CHAPTER II I - 37

SELECTED BIBLIOGRAPHY I - 41

PREFACE

This introductory paper for the meetings of the seminar on "costs and productivity" has three purposes:

(i) to recall the methodological problems related to the definition of productivity, output and efficiency in education;

(ii) to describe the difficulties inherent in the methods of evaluation and analysis;

(iii) to provide material for discussion on the improvement of efficiency in educational systems.

It has been limited (a) to summarizing the results of specialized studies and research, and (b), seeing the weakness of some conclusions, to suggesting a basis for future research.

The urgency of the concrete problems arising in education should not, in my opinion, cut short every fundamental research effort. Consequently, a considerable part of this paper is devoted to the examination of theoretical problems.

With regard to the terminology used, the fact that education is regarded as a sector of production does not in any way mean that it is nothing but that. Therefore, the use of terms such as "product, production or productivity of education" should not be interpreted as reflecting a restricted view of the function and importance of the non-economic effects of education.

INTRODUCTION

The development of education relies on financial, material and human resources that are so great that educational activity has become a leading branch of activity in all countries. In fact, there are few sectors that can claim to employ so high a proportion of qualified staff or to use so large a share of public expenditure. At the same time, there are few sectors in which productivity has evolved so sluggishly and where management has remained so conservative. In fact, educational authorities are now becoming increasingly convinced that one of the vital aims to be achieved in the next few years is to make better use of the resources available for education.

Some systems of education have been described as inefficient and others have been criticized for their low rate of productivity. The number of studies on output has increased. Techniques of systems analysis are now being applied to education, as are other methods, such as the theory of investment choice, i.e., cost-benefit analysis. The use of so wide a vocabulary not only reflects the dynamism of research in this sphere and its inter-disciplinary nature but also contributes to entertaining some confusion as to the nature of the various concepts and their practical significance 1/.

It is therefore necessary to examine the nature and meaning of the terms used. The first part of this paper is consequently concerned with definitions relating the meaning of concepts in education to that of the same concepts in economics.

1/ For the sake of illustration, here are some terms used by several authors with different meanings in each case: overall and marginal productivity; internal and external productivity; product; net yield; gross yield; apparent yield; real output; returns; effectivity; efficiency; etc.

The second part discusses (1) the methodological difficulties of evaluation **viz.** the problems of measuring productivity, output and efficiency, and (2) the general principles of analytical methodology and its application to education, followed by two annexes with numerical examples.

I. DEFINITIONS

The use of the concepts of productivity, output or yield and efficiency in education is of comparatively recent origin. It marks an extension in the use of terms originally applied in economics to the traditional productive activities.

1. The concepts used in economics

1.1 Productivity, a theoretical concept, is defined by using the concept of function of production. It is the quotient of the production of a goods item and/or a service, or the production of a series of goods and services and one or several production factors (see 12). For example, productivity may be measured in relation to fixed capital, the manpower used or investment. Usually a distinction is made between over-all and marginal productivity. Whether it is calculated on the basis of absolute figures or increments [1], productivity is an estimate of the product in factor units (or output in units of input).

1.2 **Yield or output** also represents production in relation to certain basic factors, e.g. equipment, capital, labour. In this sense, productivity and yield or output are two terms in economics covering approximately the same notion. The use of either has become current. As a result, both are used indifferently, e.g. "hourly productivity rate" or "per hour output". However, usage sometimes requires the use of one rather than the other of these terms.

---

[1] i.e. $P = (K, N, \ldots)$ a function of production; K.N. are factors. The productivity of factor K., defined on the basis of absolute figures, is given by P/K; the productivity of the factor K, on the basis of increments, is given by $\Delta P/K = \dfrac{P(K + \Delta K, N, \ldots) - P(K, N, \ldots)}{\Delta K}$

PRODUCTIVITY TRENDS IN FRANCE BETWEEN 1781 AND 1938

Years	Industry			Agriculture		
	Working population (in 000's)	Total industrial product (in millions of current francs)	Average Productivity per head of working population (estimated in current francs)	Agricultural product (in millions of current francs)	Working population (in 000's)	Average Productivity per head of working population (estimated in current francs)
1781-90	(1 600)	2 600	1 625	2 455	(5 500)	446
1803-12	(1 900)	3 718	1 957	3 208		
1815-24	(2 250)	3 916	1 740	3 643		
1825-34	(2 750)	4 966	1 806	4 210		
1835-44	(3 500)	6 385	1 824	4 357	(7 000)	622
1845-54	3 650	7 299	2 000	5 153		
1855-64	3 950	9 090	2 301	7 234	7 586	954
1865-74	3 827	10 053	2 627	8 267	7 202	1 308
1875-84	4 444	10 409	2 342	7 709	7 856	1 156
1885-94	4 564	10 555	2 313	7 132	7 219	1 175
1895-1904	5 880	11 763	2 000	7 449	8 177	1 065
1905-13	6 135	15 548	2 535	10 088	8 700	1 362
1920-24	7 100	77 476	10 912	34.4	8 540	4 569
1925-34	7 192	118 454	16 470	64.9	7 637	10 300
1935-38	6 181	107 602	17 409	59.1	7 141	10 430

Source : (19)

For example, it is usual to speak of the "yield of stocks and bonds" rather than of their "productivity", while it is far more common to refer to labour productivity than to labour output.

1.3 *Efficiency* may be defined as the capacity of producing a maximum result with a constant effort or a minimum effort with a constant result. It follows from this definition that efficiency is measured by comparing, whether implicitly or explicitly, one entity with another entity; the index of comparison of results and efforts may be regarded as an indicator of efficiency. For example, one production factor may be more efficient than another if its productivity is higher. In other words, productivity and yield may be regarded as indices of efficiency. Other indices, very similar in meaning, have also been put forward. These include the cost-benefit ratio represented by the quotient of the amount of profit (receipts less expenditure) divided by the amount of expenditure, or by extension of the relationship between value added and production factors.[1]

1.4 In short, the definitions of the various concepts referred to, all clarify the relationship between the end *product* and the *consumption* of any given *system*. For example, if the *system* concerned is a *national economy*, the average hourly productivity links the product of the system, i.e. the GDP and the consumption of the labour factor measured by the number of hours worked. Another example, is the following: if the system concerned is an electric power station, the yield is defined as a ratio of the product, i.e. the quantity of electric power supplied, to the consumption, i.e. the quantity of coal or other fuel burned in the power station, etc.

---

[1] Where R represents receipts, E expenditure, O output and I input: the cost-benefit ratio may be expressed as $\frac{R-E}{E}$ and by extension, $\frac{O-I}{I}$

1.5 In conclusion, before considering the special case of education, the definition of the various concepts involves the following notions:

- the system, which may be defined as a structured whole whose function is to consume factors and to produce goods and services;
- the products and the quantities consumed by it.

2. The concepts as used in education

2.1 What systems of reference may be used in the case of education?

(a) The national economic system (or a sub-system including education); as in the case of every productive sector, educational activity is then regarded as a factor of economic and social development.

(b) The general system of education (or a sub-system contained therein). Educational activity may then be regarded as a process consuming certain factors (teachers, equipment, fixed capital, etc.) and producing general education and specialized training.

The former case refers to productivity, output and efficiency of education as a factor. The latter case refers to the productivity, output and efficiency of various factors consumed in education as a system.

2.2 The productivity, output and efficiency of education. The contribution of education to overall economic and social development has been demonstrated in several papers /see (8) and (25)_7.[1] All these studies, whether macro- or

---

[1] Thus, while assuming that the differences of average income, among population groups provide an indication of the difference of the average contribution to production made by the individuals composing them, Denison arrives at the following figures, with the average income of those who have had eight years of education being fixed at 100.

Number of years at school	Average income spread based on average incomes of those with 8 years of formal schooling
0	50
1 - 4	65
5 - 7	80
8	100
9 - 11	115
12	140
13 - 15	165
16 and over	235

Ref (8)

micro-economic, or whether based on an analysis of statistical series or resource allocation models attempt:

(i) to check the consistency of educational achievements with regard to objectives;

(ii) to identify education; contribution to economic growth;

(iii) correlatively, to circumscribe the share allottable to education when distributing the benefits of expansion.

In this case, the concept of productivity as applied to education can hardly be distinguished from that of marginal productivity of economics. The productivity of education is defined exactly as that of capital or labour. The same holds for output and efficiency. However, it should be noted that, we make a mistake in terminology as a result of constantly referring to efficiency of education when what is really meant is the efficiency of the decision-making system. For example, an educational system which produces too large a number of good geometricians in relation to the absorptive capacity of the economy is considered inefficient, although it actually is the decision-making. The fact that an educational system produces too many art graduates and not enough scientists does not mean that it is inefficient but shows that the decision-making system is inefficient, since there is no consistency between the targets set and the decisions made to achieve them.

2.3 Productivity, yield and efficiency in education. The system of reference should be clearly defined/ see (13) /. This may be:

- an independent craftsman, his apprentice and workshop;
- a primary school;
- the secondary schools of a district;
- schools of a given area;

- a country's higher education;
- all educational activity of a country.

Consequently, concepts affecting education must be analysed in relation to a specific system. In this connexion, the selection and definition of the terms used must depend on the nature of the problems experts are trying to solve.

2.3.1 If the problem is to assess the operational efficiency of a system in order to ascertain, if necessary, ways and means of savings, one must fall back either on the concept of overall productivity /measured as a ratio of the products (or one product) to total consumption of the system_7 or the concept of marginal productivity measured by the quotient of the system's products and the consumption of one of its factors.

2.3.2 It may equally occur that the yield concept is used as an indicator of a system's efficient functioning representing the ratio of one product of the system, viz. the graduated students, to its factors, viz. enrolments. This concept of educational productivity is likely to avoid certain difficulties in measuring educational output, although it may prove a rather uncertain yield indicator whose interpretation is not always easy.

2.3.3 Lastly, the returns concept will allow comparison of alternative options, for example, when a decision has to be made between capital and recurrent expenditures. There is nevertheless a difficulty in measuring the yield of certain educational expenditures; in such a case, system analysis is often a very useful aid and essential for facilitating decision-making.

3. Educational products and factors

3.1 The definition and choice of concepts applied to education depend directly on the definition of the educational sector itself. In order to assess the productivity or the yield power of a system's factor, it is necessary first to define the nature of factors consumed in the system's process and secondly to determine the end-product of the system.

3.2 The factors entering into the system's process represent generally a series of material, financial and human resources which contribute to the functioning of the system:

- fixed capital (buildings, land, fixed assets)
- material and equipment
- enrolments by grades
- teaching, staff, administrators, etc.
- etc.

3.3 Experience shows that education, like some productive activities, supplies more than one sort of output. In fact, some expenditure is not directly linked with the teaching function as such, e.g. expenditure on health and hygiene, school canteens, boarding houses, etc. Consequently, in addition to the "products of the system linked with the teaching function", there are "related products not linked thereto".

3.4 The latter can fairly easily be defined and measured in so far as they are services in which market transactions are involved (lodging in boarding schools, meals served, medical consultations). However, the "products of the system linked with the teaching function"[1] are increasingly difficult to define since teaching activity is distinguished from other productive activities in two respects:

---

[1] For the purposes of simplification, I shall refer henceforth to "products" or "related products", as the case may be.

(i) There is no price system for educational services as such.

(ii) Unlike commercial goods and services, where the quantity sold indicated by the seller is identical to the quantity bought as acknowledged by the buyer, in education, the quantity of knowledge dispensed does not in general correspond with the quantity acquired.[1/]

3.5 In this respect, while, strictly speaking, the measurement of the output or "product" should be based on the concept of the quantity of knowledge dispensed, there is no doubt that the concepts of efficiency, productivity and yield refer to the quantity of knowledge acquired. In fact, the concrete measurement of the "product" of a system of education allows for a choice between:

(a) the quantity of knowledge dispensed either weighted or not by the size of the class (this concept is related to that of the student hour, which is useful in cost analysis);

(b) the quantity of knowledge acquired either weighted or not by the size of the class (this concept is related to that of the number of pupils leaving school after attaining a specific level of education);

[1/] It should be noted that the product of education is not restricted to the amount of knowledge acquired. Pupils do not merely acquire knowledge in schools but also behaviour habits (discipline, perseverance, tolerance, self-control, adjusting themselves, etc.). To facilitate our argument, little account is taken of this in this paper.

(c) the quantity of vocational ability acquired either weighted or not by the size of the class (this concept does in a certain respect restrict the output of education to its effect on manpower skill) /see (18)/.

Unit price analyses refer to definition (a), while the concepts of efficiency, productivity and yield are based on definitions (b) and (c).

TO SUM UP:

- A distinction must be made between the productivity (output and efficiency) of education, and productivity (output and efficiency) in education.

- These concepts relate the notion of the product and that of factor consumption of educational systems. It might in many cases be indicated to resort to the methods used for investment decisions and for system's analysis.

- Inasmuch as educational systems, like traditional production units, supply several types of production, the teaching function ought to be distinguished from the other related functions of education, e.g. boarding schools, canteens, both as regards the product and the factor consumption. Consequently, I have suggested to make a distinction between "products" and "related products".

- In evaluating "products", the two notions of quantity of knowledge dispensed and acquired has to be taken into account.

- The following definitions are put forth as basis for the subsequent statements.

(i) The efficiency of a system is its capacity to produce the maximum results with a constant effort or a minimum effort with a constant result.

(ii) Educational yield is evaluated by comparing intake and output of an educational system.

(iii) Overall productivity of the factors consumed in an educational system is the quotient of its "product" (and/or related products) divided by its consumption. The partial productivity of a factor is the relationship between the products (and/or related products) and the consumption of this factor.

II. METHODS

In the light of above definitions, two types of questions arise :

(i) How should the concepts of productivity, yield and efficiency be measured ?

(ii) How should these concepts be used in educational planning, administration and management ?

For the purpose of replying to the first question, section A will assess evaluation methods while the second question is rather concerned with analytical methods which will be dealt with under section B.

A. EVALUATION METHODS

For the sake of convenience, the methods of evaluating productivity, yield and efficiency in education will be considered one by one.

1. The measurement of productivity

1.1. A system of education may be regarded as a branch of activity the main product of which is the quantity of education dispensed (and/or acquired) but which also supplies related services not mainly linked with teaching. In measuring productivity, a distinction must be made between related and teaching services.

1.2. Related services, sometimes non-existent or negligeable but often considerable, cover those activities which do not directly deal with the teaching but which may be essential to the set-up and operation of the system. They include health and hygiene, transportation, housing and canteen services. Administration service should possibly be classified partly together with teaching activity and partly with related services.

1.3. Related services consume production factors (investment, equipment, material, upkeep and staff) and produce various types of output (meals served, housing in boarding schools, school transport, medical care, etc.).

The development of productivity for one or a group of factors, may be assessed by calculating the ratio of the volume of production (value at constant prices) to the quantity of factors consumed. Such estimates are faced with the same type of difficulties of computation as are generally met with in economic analysis. Therefore, it is unnecessary to go into detail here. However, it should be noted that the evaluation of the production of related services can be based on the cost of similar services outside education.

1.4. In considering the factors consumed by the educational sector as such, there are no special accounting problems. For example, in calculating the productivity per teacher, it is necessary to take into account the number of teachers and possibly their hours of work; to take into account the structure of the teaching body, based on qualification standards, systems of weighting are used, e.g. pay scales, or the productivity of each group of teachers is calculated separately, assuming that it is possible in reality to isolate the output of each single category. However, these are in principle the standard difficulties met with in economics in evaluating productivity.

1.5. The situation with regard to the calculation of the products of education as such is entirely different. As pointed out previously, the concept "product" in this case includes the idea of quantities of knowledge dispensed and acquired. To the extent that the aim of any sort of education is not so much to dispense knowledge as to ensure the training (general and vocational) of a number of pupils, it is my opinion that only the quantity of knowledge acquired should be taken account of in evaluating productivity. [1]

1.6. However, even if we accept the assumption that the product equals the quantity of knowledge acquired, that quantity will still have to be evaluated concretely. In view of the qualitative aspects and the complex and composite nature of the notion of acquired knowledge (skill in reading, and intellectual, writing, semantic, and counting aptitudes and the very nature and aims of education, it has not yet been possible to evaluate thoroughly and accurately the products of education. In evaluating productivity, therefore, researchers so far have never gone beyond assessing the economic aspects of the product of education. [This certainly cannot mean that the other aspects should actually be neglected, as will transpire from section B dealing with analytical approaches.] For this reason, in evaluating productivity in education as such, the notion of quantity of knowledge (and/or skill) acquired for the exercise of a vocational activity must be taken into account.

1.7. In evaluating the product in practice, the volume of enrolments at the beginning and end of each period is used together with a weighting system making it possible to calculate such flows to reflect the "economic valuation" of each student category enrolled. [1] On the assumption that it is possible to put students by categories, an adequate weighting system still has to be defined. Several solutions can be put forth, one of which, in particular seems reasonable since it discounts the mathematical expectation of future income, thus considering the economic valuation of a student to be equal to the present discount value of this student's whole prospective, active life income. [2]

---

[1] This argument certainly deserves further discussion. The following example may illustrate its purport : the hourly productivity of a teacher, calculated on the basis of the quantity of knowledge dispensed, increases constantly with the size of a form, as this quantity is in direct proportion to that size. Therefore, it should be logical to increase as far as possible the pupil/teacher ratio. However, experience shows that beyond a certain threshold the efficiency of the teacher falls to a very low level. Consequently, teacher productivity estimated on the basis of quantity of knowledge dispensed has very little meaning, whether it refers to comparing the efficiency of different systems or studying that of a particular system.

---

[1] The product may be stated in algebraic terms as follows :

N : Number of students passing from grade (i - 1) to grade (i). during the year t.

K : The duration of the cycle.

$V_i - 1$: The economic valuation of a student with educational standard (i - 1).

V_i : The economic valuation of a student of educational standard i.

The product of the educational course during the year t would then be :

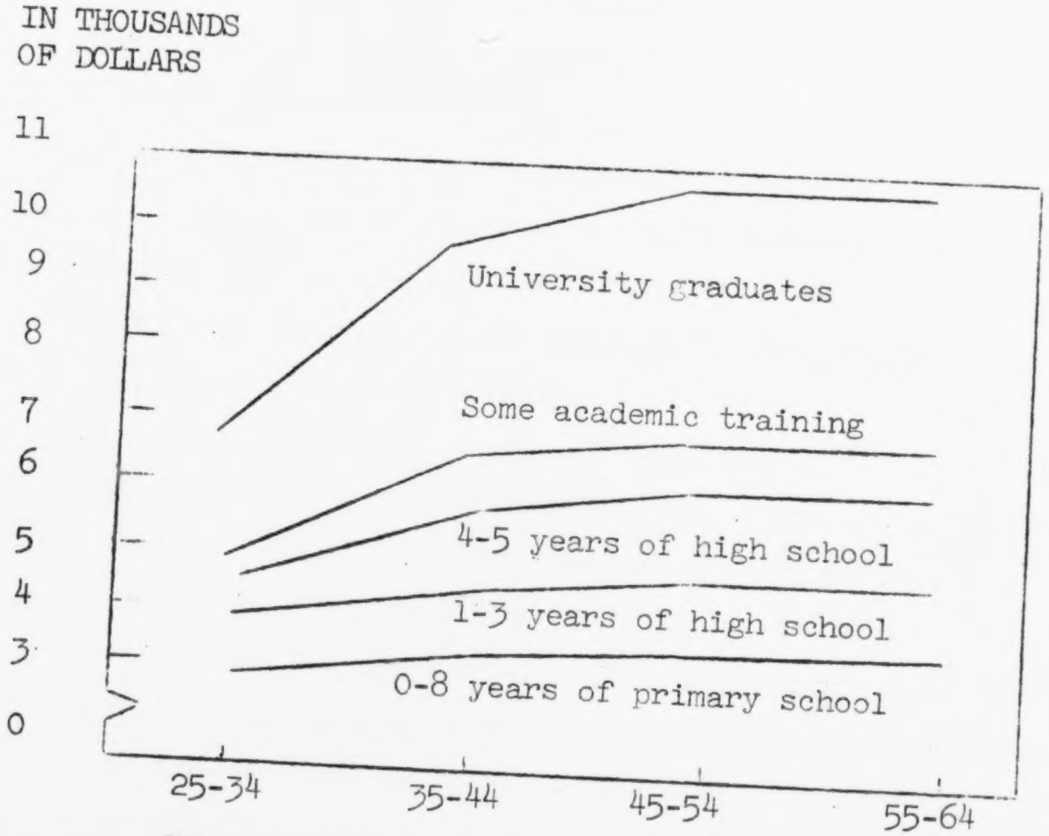
$$P_t = \sum_{1}^{K} N_i \, (V_i - V_{i-1})$$

[2] To avoid the weighting problem a productivity indicator consisting only of pupils who have completed their course can be proposed. Per-teacher productivity is calculated by the ratio of the number of pupils to teaching staff as corrected by the "actual average duration of the course", i.e. by the average length of attendance of pupils who have completed their course. This index seems highly significant when applied to the same educational system. It is hence indicated to work out analyses on a temporal series basis. However, the index is not suited for international comparison.

The following graph, based on information obtained from the 1961 Canadian census gives an example of weighting.

INCOMES PER AGE GROUP AND LEVEL OF EDUCATION IN CANADA IN 1961

(Male non-agricultural working population)



Source : [cf (2)].

1.8. Apart from the difficulties of obtaining such detailed income statistics, there are other methodological problems, not the least of which is the selection of an adequate discount rate, although this problem has been discussed in a large number of studies and specialized publications on cost benefit analysis [see (9) and (17)]. However, on the assumption that it is possible to devise a weighting pattern, figures on proper educational productivity can be made available within the limits referred to above

2. Measurement of yield and efficiency indices

2.1. Research on educational yield has been and still is considerable, as the number of specialized publications shows. Some monographs try to show how to make use of incomplete educational statistics to calculate some output rates. Others, which render student flows by means of a system of mathematical equations, try to evaluate more fully and in greater detail the components of such a yield. There are others aimed at solving specific problems which are limited to calculating very approximate yield coefficients. However, all these stress the fact that educational statistics in general are not suitable for productivity studies /see (3) and (7)/. Yet, the proposals made to improve educational statistics at international meetings afford some encouragement.

2.2. Without going into detail here on the various methods of calculating educational yield, the general principle should be recalled. To evaluate educational yield of a cohort it is necessary to calculate the proportion of graduates or school-leavers, taking into account the length of attendance at school. Obviously, the difficulty remains to sort out a "cohort" and watch its progress over a period of time.

2.3. Yield so defined makes it possible to estimate the efficiency of an educational system, by reasoning implicitly along the following lines : In an ideal case, without wastage, every pupil enrolling graduates after a minimum attendance required. In this case, the yield rate is one and the system is one hundred percent efficient. Thus, yield or output is an index of efficiency which, in spite of the reservations expressed above, is easy to assess. However, this index has some weak points which, while familiar to experts, deserve general attention here :

(i) Educational yield depends on drop-out rates per class which depend not entirely on the educational system. To some extent, these rates reflect imbalances of the educational supply and demand situation.

Consequently, the maximum reference yield is of necessity lower than one and this must be taken into account in interpreting this efficiency index.

(ii) Yield often depends less on the efficiency of education than on the institutional regime governing its operation. Reference is made only to the opposition of automatic promotion as applied by certain systems and repeating tolerance (and encouragement) of others.

Hence, yield or output rates indicating the efficiency of educational systems should be used with great caution.

2.4. Another efficiency indicator is productivity. In the case of related services, this indicator makes it possible to judge how the factors consumed are used. Thus, the fact that the productivity of a factor is higher in one system than in another shows that factor is being used more efficiently. In the same sense, as regards teaching proper, a comparison of productivity rates makes it possible to assess efficiency to the extent to which it may be shown in how far it has been possible to obtain "the same performance by using differently less resources", or how to obtain "better results by making better use of the same resources". 1/ This leads us to the analytical approach.

1/ By extension, it is possible to measure efficiency by the cost/benefit ratio, i.e. by the quotient of net income over expenditure. With regard to related services, cost analysis supplies the amount of expenditure; receipts can be calculated on the basis of prices for commercial services, thus the cost/benefit ratio can be estimated. As regards teaching proper, the amount of expenditure can also be estimated on the basis of costs; income can be estimated by following the example of the method of calculating the product as outlined above, i.e. on the basis of anticipated future income /see below under B. and in reference (1)/.

It is interesting to follow the evolution of this ratio over a period of time for each branch of education, although interpreting it in a specific case is not always easy, particularly as regards teaching and learning properly speaking.

B. ANALYTICAL METHODS

1. General remarks

1.1. The analytical approach and the evaluation approach are closely related and the distinction between them is sometimes artificial. Thus, the way of using the concept of productivity for the purpose of analysing an educational system derives naturally from the way in which this concept has been defined for education and the methods of yield evaluation referred to above. For example, in analysing the way in which a school transport service operates, the extent may be found out to which it might be possible to increase productivity by exploiting the vehicles used more intensively by changing the network of bus routes.

1.2. Equally, if the yield of an educational system should, for example, show a sharp drop in the rate of promotion at the end of a course (or for a class during a course), an examination of the reasons for this might lead to ascribing it in part to the fact that the final examination is too exacting for the actual level the students have attained. The responsible authorities might then decide either to lower the examination standards or to alter the syllabus or even to keep them unchanged.

1.3. In practice, therefore, some of the situations that should be tackled by administrative planners and administrators can be analysed on the bases of productivity, yield and efficiency, and this contributes to facilitating the making of enlightened decisions. In other situations, however, analysis based on these considerations does not facilitate action :

- Even if the productivity of a motor pool and that of boarding schools is known, this alone does not make it possible to choose - in a specific area - between setting up a network of boarding and mixed boarding schools and day schools with organized school transportation.

- Although the productivity of a teacher is far higher than that of a monitor, in the case of a specific country it might be difficult to decide, because of the high costs of teacher-training (in teacher-training colleges) and the extreme shortage of available funds, whether it is not more efficient to maintain an existing structure of teacher qualification, and be ready to promote a system of in-service training and to distribute educational tasks among teachers more rationally
- In general, the decisions made do not refer to the overall distribution of funds allocated for education but only to the allocation of an increment in financial resources made available. Educational planners have to make out where the increment is to be planned for use; school principals receiving donations have to consider how best to use them and usually have to choose among several priorities, when submitting their requests to the relevant ministry. In that connexion, it is not always enough to know the output and productivity of the system in choosing one among several priorities.

1.4. In all these situations, comparison of the probable consequences of the various possible decisions is necessary. Therefore, among the methods used in selection, analytical methods must be included, e.g. cost/benefit analysis and system-analysis.

2. The principle and the methods

2.1. Cost/benefit analysis and system-analysis both derive from the same general principle; to compare several situations from the double point of view of factor consumption and the production of goods and services, and in this way to draw up an order of preference in the light of specific criteria. In cost/benefit analysis, these criteria are generally based on economic data, but this is not necessarily the case in system-analysis.

2.2. It should be remembered that cost/benefit analysis, a tool used in economics for investment decisions, is based on the theory that it is possible to estimate the cost and the benefit of every decision. In order to classify decisions by order of preference, a calculation is made of the yield rate resulting from the ratio between the net benefit and the cost [see (23)]. In order to render yield rates or cost/benefit ratios comparable and significant, it is obviously necessary to introduce the time factor in calculation. Thus in case the expenditure involved in a decision has to be met in the year o, the aggregate benefits accruing over the succeeding years will have to be spelt out as actual value in year o. This means that benefits are discounted by deflating them through application of a discount rate.[1] As is well-known, the choice of the discount rate represents a very delicate stage in cost/benefit analysis [see (9)].

2.3. System-analysis is not based on a general and absolute method, since output and input values depend on the specific problem to be dealt with. In some systems, e.g. power conversion systems, output is measured directly in total values, e.g. calories. In other cases, analysis is concerned mainly with output variations as a function of input variations, (e.g. entropy or the quantity of information in cybernetics). In education, because of the highly complex nature of the product, output and input variations are compared. The usual approach is first to define appropriately

---

[1] Where B_i is the gross benefit for year i and a the discount rate, the accrued benefits discounted for the year o are :

$$B_o = \frac{B1}{1+a} + \frac{B2}{(1+a)2} + \dots \frac{Bi}{(1+a)}i + \dots$$

and the yield rate of the expenditure Do is given by the equation

$$\tau = \frac{Bo - Do}{Do}$$

This rate calculated for each project; in principle, the operation yielding the maximum value for τ is the most interesting.

the features of a system (known as the features of the control system) and then to vary input components and to measure their effects on the output make-up /‾see (16)_7. Comparison of characteristics of the system which show differences with those of the control system affords an order of preference. Consequently, because of the flexibility of the system-analysis method, it can be used both to examine the possibilities of an improved allocation of resources devoted to the system and to decide how increased funds made available can be used. Therefore, it can hence be considered a real aid for administrative and managerial purposes, as transpires from the following table :

COMPARATIVE TABLE SHOWING THE EFFECTS OF TWO METHODS OF RESOURCE DISTRIBUTION OF EQUIVALENT VALUE

	Supplementary lectures for average pupils (+ $ 8,000)		Tuition and supplementary guidance of pupils (1 psychologist : + $ 8,000)	
	Pupils whose I.Q. varies between		Pupils whose I.Q. varies between	
	100-120	75-100	100-120	75-100
Social studies	0	0	0	+ 0.1
Natural sciences	+ 0.1	0	0	0
Drafting ability	+ 0.2	0	0	0
Thinking ability	+ 0.2	0	0	+ 0.1
Reading : Social studies	0	0	0	+ 0.1
Reading : Natural sciences	0	0	0	0
Reading : Literature	0	0	0	0
Vocabulary	+ 0.1	0	0	+ 0.1
Average	+ 0.1	0	0	+ 0.1

Source : (16)

3. Difficulties of application to education

3.1. The cost/benefit analysis approach has been used to compare the yield rate of investments in education and in branches of productive activity in order to show the extent to which the amounts devoted to education are economically justified. Education is regarded as a production factor contributing towards general economic development. Therefore, these studies are not concerned with the distribution of funds within education; consequently, they go beyond the scope of this section, in which only the application of cost/benefit analysis as a tool of management, administration and planning in education is under discussion. Thus we are concerned with it once the overall financial resources allocated to education have been clearly circumscribed, so as to assist in deciding between the following alternatives :

- recurrent operating expenditure;
- methods of increasing the supply of trained teachers,
- etc ...

3.2. It is comparatively easy to calculate the costs of the various possible choices. However, estimating the gross or net benefit encounters the same difficulty, viz. that of quantifying output. Personally, I do not see why it would be impossible to estimate the value of output by weighting the number of pupils at the end of an educational period on the basis of the anticipated incomes per category of education. While such a weighting system is far from perfect, it marks a definite step forward since, it is better for making decisions to have weak criteria than none at all.

3.3. The difficulties of applying system analysis to education are more numerous and more important, since the aim of such analysis is to take into account both the economic and non-economic effects of education. Output is then more difficult to circumscribe since such analysis tries to assess precisely the quantity of knowledge acquired by means of testing pupils /see (10) and (11)/. It is not my intention to draw up a complete list of the difficulties of estimating that quantity, but the following is worth mentioning:

- No test, however perfect, can measure all the output factors in an educational system.
- By their very nature, the components of output are not mutually independent and the effect of two measures taken simultaneously on the output of a system does not equal the sum of the effects of each measure taken alone.
- Test results depend on factors outside the educational system perhaps as much as on factors within it. Therefore, system-analysis concentrates on variations more than on the absolute results of such tests.
- If they are to have any meaning, tests must be made on large scale samples.
- The cost of using system-analysis is prohibitive, which decreases its utility for the developing countries considerably.

3.4. The description of the analytical approaches given above has deliberately been too general. To be applied, each method has in fact to depend on the level of the decision-making unit, e.g. teacher, headmaster, vice-chancellor, director-general of primary, secondary or higher education, secretary-general of education, educational planning commission, or minister.

3.4.1. Teachers draw on their educational training, they keep in touch with developments in their sphere and try to solve the problems certain pupils empirically, and thus to improve their performance.

3.4.2. The powers of school principals vary widely according to the level of education, type of school, country, etc. If they have to request budgetary assistance for future years, they have to establish priorities and, for example, choose between different budgetary operations. When a school receives a cash donation, principals have to decide how best to use it. The principal of a small school may content himself with a very simple system-analysis. For example, if his school receives a gift of $ 8,000, he might use it either to employ a psychologist to give better guidance to poor pupils, or to pay for a system of supplementary lectures for average pupils (see table for section 23). It has been observed that average pupils can be helped to do better if they are given a little more assistance and that backward pupils can do better if they receive better guidance. A test given to pupils shows the effects of each measure, and this facilitates the selection of one or the other [see (16)].

3.4.3. At the highest level, the problems are far more complex: the location of new schools - choosing between boarding-schools, mixed boarding and day schools - methods of improving teacher training - duration of educational courses - use of new audio-visual media - selection procedures, etc... The methods of analysis described above may be used to solve some problems. In other cases, however, it is necessary to devise new and more complex ways of allocating funds (see (15) and (26)).[1]

---

[1] The criteria guiding an investment choice based on the yield rate may be recalled: This rate is given by the following equation:

$$C = B\ (r)$$

where C represents the cost of investment,
B the resulting profit.

Applying this formula to the educational sector, C_d represents the direct cost and C_o the opportunity cost; $C = C_d + C_o$; profit may be evaluated, for example, by taking the accrued differential income, viz. $B\ (r) = \sum_1^k \frac{\Delta b_i}{(1 + r)^i}$

(k represents the period of working life as from the end of educational training)

The equation for the yield rate "r" is hence:

$$\boxed{C_d + C_o = \sum_1^k \frac{\Delta b_i}{(1 + r)^i}}$$

(It should be noted that the term "investment" does not correspond to "Gross Fixed Capital Formation", but is used in a wider sense).

IN SUMMARY

In chapter II, which deals with methods of evaluation and analysis, the following conclusions were reached:

- the productivity of related services can be measured by the same methods as those used for the measurement of economic productivity.
- productivity in education as such can be measured if the product is taken to mean the economic valuation of each student.
- it is difficult to measure yield because of the need of sorting out a specific cohort and of watching its progress over time. Caution should be taken in assessing yield.
- the cost/benefit approach and system-analysis are first-rate tools for facilitating decision-making in education.
- cost/benefit analysis consists in rating decisions by order of preference on the basis of their yield potential.
- system-analysis, as applied to an educational system, consists in specifying the ratio of input to output.
- educational tests make it possible to qualify the educational "end product" with relatively good results. However, there are many obstacles to the large-scale use of these tests for surveying purposes.

ANNEX A

CHAPTER II

Hourly productivity for an educational course: Establishment of formulae and numerical example

---

1. Establishment of formulae

Let P be educational output or "production".

$P = \sum_{i=1}^{k} n_i V_i$ where : n_i = the number of pupils passing from grade (i - 1) to grade (i);

V_i = the value of the quantity of education acquired to pass from grade (i - 1) to grade (i);

k = the duration of the course.

Let us suppose that $n_i = p_i N_i$ where p_i is the promotion rate of grade i and N_i the number of pupils in grade i. Then, the number of pupils who have acquired the training provided in grade (i) equals the number admitted to grade (i + 1). This is a very strong hypothesis and is scarcely relevant in countries where an automatic promotion system works, for which other and more complex indicators should be found, e.g. the average marks obtained by pupils or teachers' reports.

Supposing that $V_i = \Delta R_i$, the value of the quantity of education acquired to pass from grade (i - 1) to grade (i) is arrived at by the discount value of the income expectancy during working life which is proportionate to the level of training. In the following, ΔR_i is referred to as "differential income".

Consequently:

$$P = \sum_{1}^{k} p_i \; N_i \; R_i$$

now $\Delta R_i = \sum_{t - 1}^{d} \frac{\Delta r_{it}}{(i + a)} t$ or Δr_{it} = differential income for year t

a = discount rate

d = length of working life reviewed

then $P = \sum_{i = 1}^{K} p_i \; N_i \left[\sum_{t = 1}^{d} \frac{\Delta r_{it}}{(1 + a)^t} \right]$

On supposing that $\Delta r_{it} = \Delta r_i$

$$\boxed{P = \sum_{i = 1}^{k} \frac{p_i \; N_i \; \Delta r_i}{a} \quad 1 - \left(\frac{1}{(1 + a)} \right)^d}$$

Let be

m_i = the number of teachers for grade i

H = the number of hours effectively worked per teacher annually:

Hourly productivity $\pi = \frac{P}{m_i H} = \frac{P}{mH}$ where m is the total number of teachers

$$\boxed{\pi = \frac{1}{am \, H} \left[1 - \left(\frac{1}{1 + a} \right)^d \right] \sum_{i = 1}^{K} p_i \; N_i \; \Delta r_i}$$

$$\pi = \pi \, (a, m, H, d, p_i, N_i \; \Delta r_i)$$

Discussion

1. π is inversely proportionate to the discount rate (a); this is not surprising since the higher the discount rate the lower the discounted value of differential income.

2. π is directly proportionate to the rate of promotion per grade. Grades with a low rate of promotion can be detected by analysis. It is therefore possible to increase that rate by increasing P_i, without lowering the standard of qualification of pupils.

3. π is inversely proportionate to the total number of teachers and directly proportionate to the number of pupils per class. This statement of the hourly productivity for an entire course means that an analysis of the teacher/pupil ratio per class should make it possible to find out ways and means of improving productivity simply by better circumscribing enrolment distribution, e.g. by eliminating low-load classes. Even if there is a relationship between the quantity of knowledge acquired and the pupil/teacher ratio, it is not very great below certain thresholds; in other words, to the extent that promotion rates reflect the importance of quantity of knowledge acquired within certain limits, an increase in the pupil/teacher ratio will not lead to any marked drop in the promotion rate.

4. The fact that π depends on the differential income or the duration of working life is hardly surprising. It is obviously extremely difficult to evaluate these two variables because of the lack of available statistics and our patchy knowledge in this respect. For now many years will the quantity of knowledge acquired have a bearing on income? What will that bearing be? These are questions for which satisfactory answers will not be found for a long time.

5. Lastly, π is inversely proportionate to the duration of work. It is difficult to express this statement in a simplified formula. It is well known that, starting from a certain level, hourly productivity in

industry decreases when working time increases, more particularly because of fatigue. The preceding formulae, which are much too approximate, do not very well lend themselves to this type of analysis[1]. Therefore, I suggest that hourly productivity and productivity per teacher ($H \times \Pi$) be regarded as equally significant.

6. Because of the lack of precision of the data required for calculation, the absolute value of hourly productivity has very little meaning. The same is not true for the indices of the evolution in time of hourly productivity. Where Π and Π give the productivity of a system for the years o and 1, the evolution index can be expressed as:

$$\frac{\Pi_1}{\Pi_o} = I_{1/o}$$

Now

$$\frac{\Pi_1}{\Pi_o} = \frac{H_o \; m_o}{H_1 \; m_1} \quad \frac{\sum p_i^1 \; N_i^1 \; \Delta r_i^1}{\sum p_i^o \; N_i^o \; \Delta r_i^o}$$

as a and **d** are constant

As a first approximation, we may assume that $H_o = H_1$ and that $\Delta r_i^1 = \Delta r_i^o$; the index $I_{1/o}$ is expressed merely as

$$I_{1/o} = 100 \, \frac{m_o}{m_1} \quad \frac{\sum_i n_i^1 \Delta r_i}{\sum_i n_i^o \Delta r_i}$$

Consequently, while the calculation of hourly productivity as defined in this paper gives rise to many difficulties, the definition of an evolution index would appear to be feasible. Educational statistics supply the values of m and n and it is possible to assess the values of Δr by means of surveys.

---

[1] School performance should have been related to the working hours of pupils, of teachers, etc...

2. Example (primary education)

A_1 The following numerical example is intended purely as an illustration. The figures given in the table are based on standards applicable to certain developing countries. This calculation shows:

a) The need to have annual figures for:
   1. promotion rates per class;
   2. number of enrolments per class;
   3. number of teachers per class and their annual hours of work;
   4. remuneration levels by level of education.

b) The need to make assumptions on:
   5. the duration of working life per age group;
   6. the discount rates;
   7. promotion being defined as meaning that only promoted pupils have acquired knowledge during the school year - this is an extreme hypothesis in the case of the final year where the examination is sometimes a means of selection rather than a means of graduation;
   8. systems excluding automatic promotion;
   9. differences in the pay scale at the beginning and end of a course; these assumptions may be based on rough estimates from which by interpolution the remuneration level for the intermediate grades may be obtained.

A_2 In the exercise hereafter, the following assumptions have been made:

- $ 20	base salary (without primary education)
- 10%	discount rate
- 20 years	the period of working life for which the level of education influences the rate of pay.

- 1,800 hours per annum; hours worked per teacher
- 3,710 : number of primary school teachers for year 1
  (pupil/teacher ratio = 45)
- 8.15 : the multiplying coefficient for differential incomes.
  Where ΔR is the annual differential income, the
  incomes over 20 years can be expressed :

$$\frac{\Delta R}{1.10} + \frac{\Delta R}{(1,10)^2} + \ldots + \frac{\Delta R}{(1,10)^{20}} = \frac{\Delta R}{1.10} \quad 1 - \frac{\left[\frac{1}{1.10}\right]^{20}}{1 - \frac{1}{1.10}} \quad \# \; 8,5 \Delta R$$

Grade	Promotion rate		Number of pupils in '000		Number of promotions in '000		In-come	R	$\triangle r_i$	Output in $ per month	
	0	1	0	1	0	1	%			0	1
CP_1	31%	35%	70	80	21.7	28.8	2%	20 4	0.4	8 680	11 520
CP_2	70	72	37	45	25.9	32.4	4%	21.2	0.8	20 720	25 920
CE_1	58	60	24	30	13.9	18.0	8%	22.9	1.7	23 630	30 600
CE_2	71	70	15	20	10.6	14.0	8%	24.7	1.8	19 080	25 200
CM_1	63	60	12	15	7.6	9.0	10%	27.2	2.5	19 000	22 500
CM_2	50	50	9	11	4.5	5.5	10%	29.9	2.7	12 150	14 850
			167	201						103260	130 590

1. The annual differential income is about $ 1 239 000 for year 0 and $ 1 567 000 for year 1.
2. The differential income accrued over 20 years and discounted per school year is $ 10.5 million for year 0 and $ 13.3 million for year 1.
3. Year 0 contains 6 678 000 working hours (3 710 x 1 800) and year 1 8 046 000 (4 470 x 1 800).
4. Expressed in dollars, hourly productivity is 1.57 for year 0 and 1.65 for year 1.
5. The productivity index fixed at 100 for year 0 is about 105 for year 1.

ANNEX B

CHAPTER II

Theoretical example of the use of unit-cost analysis as an instrument for investment decisions.

B_1

The problem is to provide schooling for 540 pupils dispersed over a specific geographical area: the following alternatives are possible:

1) to construct three mixed boarding schools with six classes of 30 pupils and to provide a system of bus transport;
2) to construct a school with 18 classes with boarding accommodation for a fraction of the pupils enrolled.

B_2

Analysis can be simplified considerably by using the following assumptions:

(i) the annual cost of operating is the same in both cases. [The recurrent costs of school transport (and the additional fixed cost) are equivalent to the operating costs of a boarding school]. However, it is probable that the total operating costs of an 18-class school are lower than the operating costs of three 6-class schools.

(ii) it is also assumed that neither solution proposed will have any effect on school performance. However, it is likely that boarding-schools may have a beneficial effect on the performance of pupils, especially those of lower class origin.

(iii) final assumption : no account is taken of the expenditure to be met by families.

B_3 In spite of all these simplifications, the following numerical example provides an illustration of an analytical approach.

TABLE OF DATA

Number of pupils	180	540	
		Solution A	Solution B
Number of classes per school	6	3 x 6	18
Area in sq. m.			
Sports	280	840	280
Music			50
Manual training shops			280
Refectory and misc.			225
3 laboratories	230	690	230
Classrooms	240	720	720
Library	70	210	150
Common rooms (kitchens...)	100	300	200
Total area:	920	2 760	1 935
Circulation (20%)	184	552	387
Principal's apartment	75	225	75
Total	1 179	3 537	2 397
Boarding accomoda- tion area (lump estimate) 12 sq.m./360	-	-	4 020
Grand total:	1 179	3 537	6 417
Average unit construction cost ($ 60)		212 220	385 020
Lump cost of equip- ment		notional[1]	notional[1]
Utilisation cost over 30 years, duration of life (25%)		53 055	96 255
Fixed overall cost		265 275	481 275
Fixed annual cost (1/30)		$ 8 842	$ 16 042

---

[1] The equipment is not listed in detail for the sake of simplification.

B_4 Observations

- The fixed cost is:
  - $ 8,842 for solution A.
  - $16 042 for solution B.
- However, if solution A is adopted, the transportation costs must be added:
  - 6 buses seating 60
  - $ 10,000 per bus
  - length of service: 7 years
  - i.e. $ 8,555 per annum.
- The annual costs thus become:
  - $ 17,397 for solution A
  - $ 16,042 for solution B

- At the risk of oversimplification, this example (see (22)) shows, nevertheless, the need for being as comprehensive as possible when computing total cost of alternative options, so as to be able to arrive at a sound decision. It enlightens the possibility of savings in school buildings by making more intensive use of facilities. Approaches of this kind (though more elaborate) should be applied more systematically when deciding on the location of school buildings.

SELECTED BIBLIOGRAPHY

(1) G.S. BECKER - "Underinvestment in College Education", The American Economic Review, May 1960.

(2) G. BERTRAM - "The Contribution of Education to Economic Growth", The Economic Council of Canada Staff Study No. 12, 1966, Ottawa.

(3) D. BLOT - "Les déperditions d'effectifs scolaires", Tiers Monde, 1965, Paris.

(4) BRANDE and others - "Survey of vocational training and technical education in Nigeria", American ORT Federation.

(5) D. CALCOTT - "Some trends in Education in the Western Region of Nigeria, 1955-1965", International Labour Office Mission, Ibadan, October 1965.

(6) M. DAVIS - "Survey of the Status of the Teaching Profession in the Americas", World Confederation of Organizations of the Teaching Profession, Washington, 1964, USA.

(7) I. DEBLE - "Les rendements scolaires dans les pays d'Afrique d'expression française", Tiers Monde, Etude, 1964, Paris.

(8) E. DENISON - "La mesure de la contribution de l'enseignement à la croissance économique" in "Le Facteur résiduel et le progrès économique", OECD, 1964, Paris.

(9) M. FELDSTEIN - "The social time preference discount rate in cost benefit analysis" in "The Economic Journal", June 1964, London.

(10) J. FLANAGAN - "Project Talent; Studies of the American High School", Cooperative Research Project No. 226 - University of Pittsburgh, 1962, Pennsylvania, USA.

(11) A. FOSHAY - "Performances intellectuelles des écoliers de 13 ans dans 12 pays", Unesco Institute for Education, Hamburg, 1964.

(12) J. FOURASTIE - "La productivité", P.U.F., Paris.

(13) J. HALLAK - "Cost, Productivity and Efficiency of Educational Systems", IIEP/S5/2; April 1966, Paris.

(14) INTERNATIONAL BUREAU OF EDUCATION UNESCO - "Shortage of primary teachers", Publications No. 256, 1963, Paris.

(15) R.J. JUDY - "A new tool for educational administrators", published by University of Toronto Press, 1965, Canada. (An ideal pattern for university administration).

(16) J. KERSHAW, R. McKEAN - "Research memorandum - Systems analysis and education", The Rand Corporation RM-2473 FF, Santa Monica, 30 October 1959, California, USA.

(17) N. LEFF - "A note on the quality-quantity problem in education", IIEP/S7/2, May 1966, Paris.

(18) F. MACHLUP - "The production and distribution of knowledge in the United States".

(19) T.J. MARKOVITCH - "L'industrie française de 1789 à 1964 - Conclusions générales", ISEA, Paris 1966.

(20) MINISTERE DE L'EDUCATION NATIONALE - "Statistique; situation de l'enseignement au 13 janvier 1964", République de la Côte-d'Ivoire.

(21) NATIONS UNIES - "Revue mensuelle de statistiques, février 1967", United Nations, New York.

(22) G. ODDIE - "School building resources and their effective use", OECD, 1966, Paris.

(23) A.R. PREST, R. TURVEY - "Cost Benefit Analysis : A Survey." The Economic Journal, December 1965, London.

(24) Gulax SINGH, Y.D. SHARMA, D.L. SHARMA - "Statistics on comparative education in selected countries", Education Commission Government of India, December 1965.

(25) S. STROUMILINE - "Aspects économiques de l'enseignement en URSS", Revue Internationale des Sciences Sociales, Vol. XIV, 1962.

(26) J.L. TRUMP, Dorsey BAYNHAM - "Guide to better schools: Focus on change". Rand McNally and Company, 4th Printing, Chicago, 1963.

(27) UNESCO - "Annuaire Statistique 1965", Unesco, Paris.

(28) R. Van WAEYENBERGHE - "Le rendement de l'enseignement secondaire", République de Tunisie, Secrétariat d'Etat à l'Education Nationale.

RENDEMENT ET PRODUCTIVITE DE L'ENSEIGNEMENT

par Lê Thành Khôī

TABLE DES MATIERES

Pages

I. Le rendement de l'enseignement II- 1

II. La productivité de l'enseignement II-10

En économie, le rendement se définit comme un rapport entre un résultat et le moyen mis en oeuvre pour l'obtenir, les deux étant de même nature et exprimés avec la même unité (rendement en sucre de la betterave); l'usage cependant l'a étendu à tout rapport entre deux faits chiffrables dont l'un est considéré comme un effet de l'autre (rendement d'un ouvrier exprimé en tonnes produites, par exemple). 1/

Le rendement a ainsi un sens plus étroit que la productivité qui se définit comme "la mesure de l'économie des moyens", une relation entre un produit et ses facteurs. On peut considérer soit un seul facteur (productivité du travail), soit l'ensemble des ressources utilisées : nombre d'heures ouvrées, capital physique, capacités intellectuelles, c'est-à-dire la productivité totale des facteurs. Seule cette dernière est apte à indiquer le degré d'efficience d'une économie et de ses diverses branches.

Ces concepts peuvent être appliqués à l'enseignement.

I. LE RENDEMENT DE L'ENSEIGNEMENT

Le rendement doit être envisagé sous ses deux aspects : quantitatif et qualitatif.

Quantitativement, il s'évalue en termes d'élèves formés ou de diplômés (les deux termes n'ont pas le même sens) par rapport à l'ensemble correspondant des effectifs mis à l'école.

1/ Agence européenne de Productivité, Mesure de la Productivité, I. Concepts, OECE, Paris, 1955, p. 29-Sq

* Cette étude est extraite d'un ouvrage intitulé L'Industrie de l'enseignement (sous presse)

Qualitativement, il s'apprécie d'un point de vue pédagogique : la mesure des connaissances et des aptitudes intellectuelles, et d'un point de vue socio-économique : l'aptitude à répondre aux besoins de l'économie et de la société. Cette qualité "fonctionnelle" ne peut être séparée de la qualité pédagogique, car quel est le rendement d'une école si les enfants qui en sortent ne trouvent pas d'emploi ou trouvent un emploi auquel ne les a pas préparés leur formation ?

Notons que la qualité peut s'exprimer en termes quantitatifs : par les notes de classe, les scores obtenus aux tests de connaissances et d'intelligence, la proportion de chômeurs intellectuels, le revenu dû à l'instruction, etc...

Nous n'envisagerons pas ici les problèmes de qualité.

Sous l'angle quantitatif, il faut distinguer le rendement apparent du rendement réel. 1/

Le rendement *apparent* compare uniquement les effectifs inscrits d'un cours par rapport à ceux d'un autre cours, tandis que le rendement réel tient compte des redoublants. Le calcul de ce dernier nécessite donc des statistiques plus détaillées que celui du premier.

Rendement apparent

Dans la plupart des pays, même les plus développés, on ne possède que des statistiques d'effectifs inscrits par cours, sans distinction entre nouveaux et redoublants. L'intérêt porté à ce problème est en effet récent, lorsque les économistes se sont mis à calculer le coût de l'enseignement et à faire ressortir la lourde charge qu'entraînent les déperditions. L'enseignant lui-même répugne à enregistrer de telles statistiques, pour des raisons humaines

---

1/ Distinction introduite par I. Deblé, "Les rendements scolaires en Afrique", in IEDES, *Problèmesde planification de l'éducation*, Etudes Tiers Monde, Paris 1964.

et pédagogiques compréhensibles. C'est cependant leur connaissance précise qui permet d'évaluer le rendement de l'école et la production annuelle qu'elle peut mettre à la disposition de la société et de l'économie.

Soit E^1_t l'effectif du cours I en l'année t
E^2_{t+1} " " II " $t + 1$
$E^n_{t+(n-1)}$ " " n " $t + (n-1)$

n étant la dernière année du cycle. Le taux de rendement apparent est le rapport entre l'effectif du dernier cours et celui du premier.

$$\frac{E^n_{t+(n-1)}}{E^1_t}$$

On peut aussi prendre au numérateur non pas l'effectif inscrit, mais seulement les diplômés

$$\frac{D^n_{t+(n-1)}}{E^1_t}$$

Le taux de déperdition est le complément du taux de rendement.

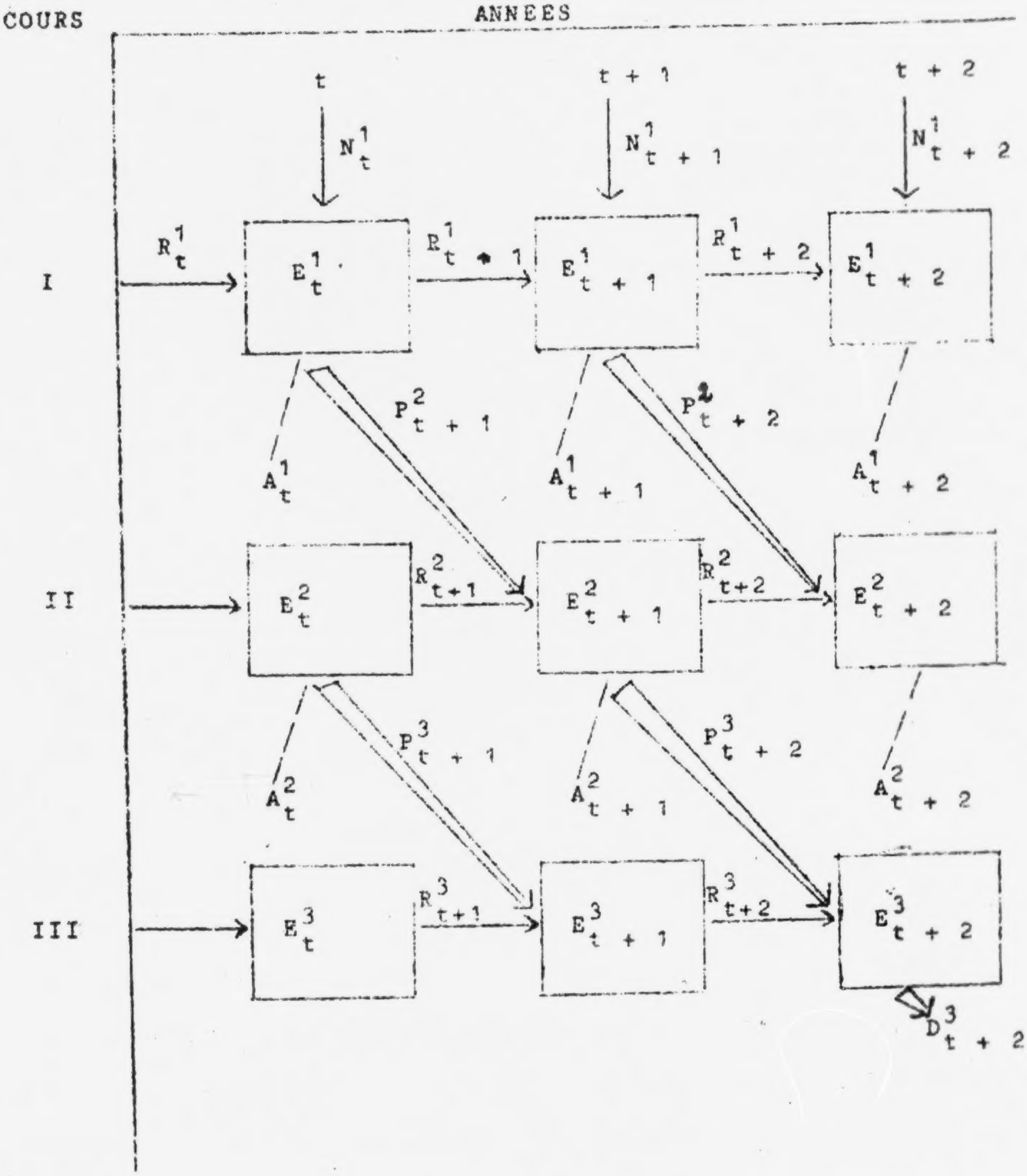
$$1 - \frac{E^n_{t+(n-1)}}{E^1_t} \quad \text{ou} \quad 1 - \frac{D^n_{t+(n-1)}}{E^1_t}$$

Il est intéressant de calculer les taux de déperdition (ou de rendement) d'un cours à l'autre pour savoir quels sont ceux qui présentent le plus d'obstacles à la progression de l'écolier, de manière à y porter remède.

Rendement réel

Son analyse suppose, nous l'avons dit, l'existence de statistiques sur la répartition des effectifs scolaires par année d'étude et le nombre de redoublants par année d'étude. Il est bon que ces statistiques s'étendent sur la durée totale du cycle pour une ou plusieurs cohortes scolaires, mais une première approximation peut être donnée par la répartition par année d'étude des effectifs de deux années scolaires consécutives, avec le nombre de redoublants par année d'étude pour la seconde année.

Le schéma suivant permet de préciser l'évolution réelle des effectifs dans un cycle de trois années (de t à t + 2) N désignant les nouveaux inscrits (pour plus de précision, il aurait fallu faire figurer aussi la mortalité).


COURS
ANNEES
t
t + 1
t + 2
N^1_t
N^1_{t+1}
N^1_{t+2}
I
II
III
R^1_t
E^1_t
R^1_{t+1}
E^1_{t+1}
R^1_{t+2}
E^1_{t+2}
P^2_{t+1}
P^2_{t+2}
A^1_t
A^1_{t+1}
A^1_{t+2}
E^2_t
R^2_{t+1}
E^2_{t+1}
R^2_{t+2}
E^2_{t+2}
P^3_{t+1}
P^3_{t+2}
A^2_t
A^2_{t+1}
A^2_{t+2}
E^3_t
R^3_{t+1}
E^3_{t+1}
R^3_{t+2}
E^3_{t+2}
D^3_{t+2}

II. 5

De t à t + 1, le rendement apparent de la cohorte E^{1}_{t} du cours I au cours II est mesuré par le rapport.

$\frac{E^{2}_{t+1}}{E^{1}_{t}}$, le rendement réel par le rapport $\frac{P^{2}_{t+1}}{E^{1}_{t}}$.

La production en fin de cycle est soit E^{3}_{t+2} si l'on considère l'ensemble des élèves qui y arrivent, soit D^{3}_{t+2} si l'on considère seulement les diplômés. Dans les deux cas, cette production n'est pas issue tout entière de la cohorte E^{1}_{t}, car elle inclut des redoublants venant d'autres cohortes (R^{2}_{t+1}, R^{3}_{t+2}).

On pourrait toutefois calculer ce que devient la cohorte E^{1}_{t} en faisant l'hypothèse que les taux de promotion et de déperdition calculés sur les effectifs totaux s'appliquent également à la cohorte. On appliquerait ainsi à P^{2}_{t+1} les taux de promotion et de redoublement du cours II au cours III pour avoir P'^{3}_{t+2} et R'^{2}_{t+2}.

Le rendement de la cohorte E^{1}_{t} sera mesuré par le rapport $\frac{P'^{3}_{t+2}}{E^{1}_{t}}$,

P'^{3}_{t+2} représente les élèves issus de la cohorte E^{1}_{t} qui arrivent en fin d'études en l'année t + 2 sans redoubler. Mais une autre partie de cette cohorte y arrivera également, en l'année t + 3, après avoir redoublé. On l'obtient en appliquant à l'effectif $P'^{2}_{t+2} + R'^{2}_{t+2}$ le taux de promotion du cours II au cours III. On pourrait faire les mêmes calculs pour ceux qui auraient redoublé deux fois. Cette méthode permet de présumer ce que devient une cohorte à un moment donné, sa répartition entre les différents cours et entre promus et redoublants (en admettant ou non que le redoublement peut se poursuivre indéfiniment).

7

$$\begin{tikzcd}
 & t & t+1 & t+2 & t+3 \\
\mathrm{I} & E^{1}_{t} \arrow[r] \arrow[dr, dashed] & R^{1}_{t+1} \arrow[r, dashed] \arrow[dr, dashed] & R'^{1}_{t+1} \arrow[dr, dashed] & \\
\mathrm{II} & & P^{2}_{t+2} \arrow[dr] \arrow[ddr] & P'^{2}_{t+2} & P''^{2}_{t+3} \\
 & & & R'^{2}_{t+2} \arrow[r, dashed] \arrow[dr] & R''^{2}_{t+3} \\
\mathrm{III} & & & P'^{3}_{t+2} \arrow[dr] & P^{3}_{t+3} \\
 & & & & R''^{3}_{t+3}
\end{tikzcd}$$

Pour évaluer le rendement exact d'une cohorte, il faut connaître la carrière scolaire précise de chaque élève en fin de cycle, ou de chaque diplômé. [1]

En raison de la difficulté de séparer les redoublants des non redoublants au sein d'une promotion, on peut calculer, comme indicateur de rendement, ainsi que l'a proposé I. Deblé, le rapport entre le nombre des sortants S (élèves en fin de cycle, diplômés ou non) et le total des effectifs engagés dans le cycle, c'est-à-dire le nombre N des élèves nouvellement inscrits augmentés du nombre total des redoublants R, de la première à la dernière année du cycle, soit

$$\frac{S}{N + \sum_{1}^{n} R_i} \quad \text{ou} \quad \frac{S}{E^1 + \sum_{2}^{n} R_i} \quad (n = \text{dernière année du cycle})$$

---

[1] C'est ce qui a été fait dans l'enquête d'Isabelle Deblé au Mali et en Côte-d'Ivoire (op. cit.)

C'est-à-dire dans notre système

$$\text{soit } \frac{E^{3}_{t+2}}{N^{1}_{t} + R^{1}_{t-1} + R^{2}_{t} + R^{3}_{t+1}} = \frac{E^{3}_{t+2}}{E^{1}_{t} + R^{2}_{t} + R^{3}_{t+1}}$$

$$\text{soit } \frac{D^{3}_{t+2}}{N^{1}_{t} + R^{1}_{t-1} + R^{2}_{t} + R^{3}_{t+1}} = \frac{D^{3}_{t+2}}{E^{1}_{t} + R^{2}_{t} + R^{3}_{t} + 1}$$

D'après notre schéma, on voit qu'il suffit, pour calculer les taux de déperdition, de connaître la répartition des effectifs par année d'étude pour une année et la répartition entre nouveaux inscrits et redoublants par année d'étude pour l'année suivante. Pour projeter l'évolution de la cohorte, on admettra que les taux constatés seront constants pour chaque cours, par exemple que $r^{3}_{t} = r^{3}_{t+1}$ et $p^{2}_{t} = p^{2}_{t+1}$

On admettra la même hypothèse en ce qui concerne le pourcentage de diplômés par rapport à l'effectif de la dernière année d'étude.

Soit le cas de l'Algérie. Les effectifs algériens dans l'enseignement primaire public se présentaient de la façon suivante au cours des années 1962-63 et 1963-64 : [1]

Tableau: Effectifs algériens dans l'enseignement public

	1962-63	1963-64					
		P	R	Total	p	r	a
I (CP_1) [1]	250 210	241 647	81 158	322 805	0,65	0,32	0,03
II(CP_2)	186 380	161 545	57 233	218 778	0,64	0,31	0,05
III(CE_1)	140 730	119 831	42 298	162 129	0,65	0,30	0,05
IV(CE_2)	113 670	91 395	32 300	123 695	0,67	0,28	0,05
V(CM_1)	70 160	75 689	20 988	96 677	0,57	0,30	0,13
VI(CM_2)	33 720	40 218	9 362	49 580	0,60[2]	0,28	0,12
Total	794 870			973 664			

---

[1] Lê Thanh Khôi, Algérie, : Planification de l'Education UNESCO/RP/ALG/EDS, Paris, Décembre 1964.

(1) CP = Cours préparatoire ; CE = Cours élémentaire ;

CM = Cours moyen

(2) y compris 0,10 entrés dans la vie active

$$p^1 = \frac{161\ 545}{250\ 210} = 0{,}65 \qquad r^1 = \frac{81\ 158}{250\ 210} = 0{,}32$$

$$a^1 = 1 - (0{,}65 + 0{,}32) = 0{,}03$$

Si l'on veut projeter l'évolution de la cohorte de 250 210 élèves en CP_1 en 1962-63 (on n'en connaît pas la répartition entre nouveaux et redoublants) jusqu'au CM_2 six ans plus tard, on admettra qu'elle connaîtra les taux de promotion suivants : 0,64 (II) en 1964; 0,65 (III) en 1965; 0,67 (IV) en 1966; 0,57 (V) en 1967. Avec également des taux de redoublement et d'abandon constants, l'effectif de CM_2 en 1967-68 sera de 112 428 élèves, dont 85 585 promus et 26 843 redoublants :

	1962	1963	1964	1965	1966	1967
I	250 210					
II		R 57 233 P 161 545				
III			R 48 639 P 140 018			
IV				R 39 205 P 122 627		
V					R 38 213 P 108 427	
VI						R 26 843 P 85 585

Le total des effectifs engagés dans le cycle s'élève à :

$$N + \sum_{1}^{6} R = E^1 + \sum_{2}^{6} R = 250\ 210 + 210\ 133 = 460\ 343$$

Le rendement réel sera égal à :

112 428 : 460 340 = 0,24,

ou, si l'on prend les certifiés d'études primaires, qui représentent le tiers de l'effectif du CM_2 :

37 476 : 460 340 = 0,08,

alors que le rendement apparent est égal à :

112 428 : 250 210 = 0,45

Le rendement réel du cours I est égal au taux de promotion.

En appliquant les taux de promotion à la cohorte des 250 210 élèves inscrits en cours I en 1962, on aurait en cours VI en 1967 un effectif de :

250 210 x 0,65 x 0,64 x 0,65 x 0,67 x 0,58 = 26 115 élèves parvenus en fin de cycle sans avoir redoublé.

II. LA PRODUCTIVITE DE L'ENSEIGNEMENT

La productivité est, nous l'avons dit, le rapport entre un produit et les facteurs qui ont concouru à sa formation.

Beaucoup d'auteurs parlent de productivité en raisonnant uniquement sur les coûts de l'enseignement. Or, ils ne constituent que l'un des termes de la productivité. Des coûts croissants ne signifient pas nécessairement une baisse de la productivité, pas plus que des coûts décroissants ne dénotent une hausse de la productivité. Seules des études liant le produit et ses facteurs peuvent fournir des critères sûrs pour apprécier l'efficacité d'un système d'enseignement, pour choisir entre telle ou telle méthode.

Dans l'industrie, on mesure souvent la productivité par le rapport entre la production et le nombre d'ouvriers ou le nombre d'heures travaillées, ce qui ne tient pas compte des changements dans la structure et la qualité du capital. Dans le domaine de l'éducation, le calcul du nombre de diplômés par heure d'enseignement serait fallacieux à cause de l'inflation constante des programmes et de la tendance à la diminution du rapport élèves/maître. Il faut donc faire intervenir les autres éléments, notamment l'équipement et le capital, en d'autres termes évaluer la *productivité totale des facteurs*.

Produit et facteurs doivent être mesurés en termes réels. En effet, il peut ne pas y avoir coïncidence entre la productivité *réelle* (ou *physique*) qui seule importe de notre point de vue, et la productivité *en valeur*, qui dépend de la conjoncture.

Supposons, par exemple, que le perfectionnement des ouvriers d'une entreprise amène une hausse de la productivité et des salaires. A la suite d'un facteur exogène (nouvelle politique gouvernementale, traité de commerce international), des produits étrangers viennent concurrencer les produits locaux. Si cet afflux entraîne une chute des prix et oblige l'entreprise à réduire les salaires des travailleurs, ils ne percevront pas de bénéfice monétaire, bien que leur productivité ait augmenté.

De même, dans l'agriculture, si la vulgarisation, l'adoption d'engrais et d'insecticides, l'amélioration de l'outillage, amène une hausse de production, mais que l'offre devienne trop abondante pour une demande inélastique, cas assez fréquent, les prix vont tomber et la productivité monétaire sera nulle pour les paysans, sinon même négative.

D'autres difficultés ont des causes socio-économiques. Dans les régions où prédomine le latifundisme, où les paysans pauvres et sans terre doivent subir des salaires misérables ou payer des rentes élevées pour le champ qu'ils cultivent, une augmentation de productivité profitera davantage au propriétaire qu'à eux-mêmes. Or, s'ils ne peuvent obtenir le fruit de leur effort, ils ne seront pas encouragés à innover.

Tous ces problèmes doivent être envisagés par l'autorité politique afin que le niveau de vie des masses s'élève avec celui de leur éducation et de leur productivité, ce qui peut entraîner, dans certains cas, des réformes structurelles. Du point de vue plus limité de l'analyse économique, celle-ci se concentrera sur la productivité réelle ou physique, mesurée en prix constants.

La méthodologie nécessite des données quantifiées, recueillies au début et à la fin du projet, avec dans l'intervalle des évaluations périodiques. Dans la comparaison de deux méthodes ou techniques d'éducation, il faudra, naturellement, constituer un groupe expérimental et un groupe témoin.

Examinons maintenant les deux termes de la productivité de l'enseignement.

Le produit est défini par le nombre de diplômés ou le nombre d'élèves formés, au sens que nous avons donné à ce terme, c'est-à-dire de diplômés et de non diplômés parvenus à la dernière année d'étude. Ce nombre doit être pondéré, qualitativement, par le niveau de connaissances et d'aptitudes acquises, économiquement par la "valeur" du diplôme, c'est-à-dire la rémunération qu'il confère à son détenteur pendant sa vie active (seul critère pouvant être utilisé dans les conditions statistiques actuelles).

Il est fréquent d'entendre le corps enseignant se plaindre de la baisse du niveau des élèves. Il s'en plaint en réalité depuis des siècles, sinon depuis des millénaires. Mais, si l'on compare simplement les manuels employés aujourd'hui dans les classes à ceux d'il y a vingt ou trente ans, la comparaison est sans conteste à l'avantage des premiers. On s'expliquerait mal d'ailleurs comment les progrès scientifiques et techniques de notre époque seraient possibles sans une élévation constante du niveau d'instruction de tous : car ces progrès ne sont pas dus seulement à quelques esprits éminents, mais aussi au concours d'une multitude de collaborateurs moyens. Certes, dans les jeunes Etats où une expansion de la scolarisation née de l'indépendance succède brusquement à une éducation pour une minorité, une baisse de la qualité peut intervenir à cause du manque de maîtres et d'équipement. Mais, dans les Etats industrialisés, la tendance à long terme est à l'avancement du niveau scolaire. Aux Etats-Unis, Havighurst cite des exemples d'universités qui, face à une demande croissante, ont élevé leurs normes d'admission : tel collège de lettres qui, en 1940, acceptait des diplômés de high school ayant obtenu aux tests d'aptitude des notes situées entre le premier quartile et la moyenne nationale, n'admettait plus que rarement, en 1959, ceux qui n'ont pas atteint cette dernière. L'Université de Harvard note que le 10ème centile de la classe de 1963 égale le 40ème centile de la classe de 1956 aux tests d'aptitude mathématique et le 45ème aux tests verbaux. Certes, cette élévation du niveau dans certaines universités peut entraîner une baisse dans d'autres, mais les études montrent que la plupart enregistrent des gains.1/

L'évaluation de la valeur de l'instruction pose de nombreux problèmes qui ne sont pas encore résolus. En effet, l'instruction apporte des bénéfices personnels et matériels à l'individu et à sa famille, des bénéfices économiques à l'entreprise où il travaille, des bénéfices financiers au budget de l'Etat, sans parler de bénéfices sociaux pour la collectivité tout entière. Dans l'état actuel de nos connaissances où il n'est pas possible de mesurer ce qui revient à l'aspect "consommation" de l'éducation, on ne peut tenter d'approcher que son aspect "investissement" (Nous retrouverons ces problèmes quand il s'agira de mesurer l'apport de l'enseignement à la croissance économique).

1/ S. Harris in OECD, Economic Aspects of Higher Education, op cit. p. 23

Pour l'individu, l'instruction signifie généralement une augmentation de productivité et de gain. Certes, la relation n'est pas parfaite. L'instruction seule ne suffit; bien d'autres facteurs, tels que l'âge, la qualification, l'expérience, les qualités humaines, y contribuent. D'un autre côté, les imperfections du marché créent des distorsions entre le salaire et la productivité marginale. En gros, cependant, il existe une corrélation positive entre le niveau d'instruction et le niveau de rémunération. Mais il faut prendre garde que l'évaluation de la valeur du capital intellectuel à partir des données sur l'âge, l'instruction et le gain, tend à sous-estimer la productivité future des jeunes travailleurs actuels : car, dans une économie en expansion, la tendance est à l'élévation à la fois du niveau d'instruction de la force de travail et du niveau des rémunérations qu'elle reçoit.

L'éducation de la femme joue un rôle très important, même lorsqu'elle ne participe pas à la vie active. Cette influence se manifeste non seulement dans l'éducation des enfants, mais aussi dans l'entretien, l'alimentation, la santé de toute la famille. Ainsi l'éducation ménagère, de la nutrition, de la santé, entraînera-t-elle moins de dépenses de maladies, un meilleur équilibre de la consommation, un meilleur rendement de travail, dont témoignera le budget familial.

Pour l'entreprise, l'éducation des travailleurs exerce des effets favorables tant sur l'emploi que sur la productivité. En effet, l'existence de cadres qualifiés permet d'utiliser un plus grand nombre de manoeuvres et d'ouvriers qualifiés : en ce sens, l'éducation est un "multiplicateur" d'emploi. L'augmentation des bénéfices pour l'entreprise peut dépasser celle des coûts pour plusieurs raisons : hausse de productivité supérieure à l'accroissement du taux des salaires, économie dans l'emploi des ressources, meilleure organisation : moins de surveillants, moins d'accidents du travail (parce que les ouvriers alphabétisés peuvent lire les notices sur l'utilisation des machines), d'où moins de primes d'assurances à payer. Finalement, l'élévation du niveau d'instruction des travailleurs permet à la firme d'introduire un équipement de plus en plus complexe et de passer à un stade de techniques de production supérieures : tel a été le cas de Miferma en Mauritanie.

Comme à l'industrie, l'éducation apporte à l'agriculture des bénéfices distincts de ceux que reçoit le paysan. Pour une ferme ou une coopérative, ils prennent la forme d'une meilleure comptabilité et gestion, une augmentation de la propension à épargner et à investir, une réduction du gaspillage de ressources dû à l'ignorance dans les méthodes de conservation, de transformation, de distribution des produits, une meilleure défense contre les intermédiaires.

Là où prédomine le chômage ou le sous-emploi rural, la productivité agricole pourra être élevée grâce au transfert de l'excédent de main-d'oeuvre formée dans des secteurs plus productifs : grands travaux de mise en valeur du sol et de l'eau, industrie minière et forestière, où les nouvelles qualifications acquises seront utilisées avec profit. Le résultat en sera non seulement un revenu accru pour les travailleurs, mais le développement de la production et de l' infrastructure pour toute la collectivité.

Pour l'Etat, l'éducation des citoyens constitue avant tout une mesure de démocratie, mais, indépendamment de bénéfices sociaux difficiles à évaluer, l'élévation des qualifications et, par suite, de la productivité et de la production, entraîne une augmentation des recettes fiscales (aussi bien des impôts à la production ou sur le chiffre d'affaires que sur le revenu individuel) et une diminution des subventions aux entreprises déficitaires.

Dans ce calcul, il faut bien entendu éviter les doubles emplois, puisque le revenu brut d'une personne ou d'une firme comprend unepart d'impôt.

L'évaluation des coûts soulève moins de problèmes que celle du produit. Il faut tenir compte de toutes les dépenses d'investissement et de fonctionnement. Lorsque les mêmes bâtiments servent à l'éducation des enfants et des adultes, lorsque les mêmes moyens audio-visuels : films, radio, télévision, servent à la fois à l'enseignement et à d'autres fins, il y a lieu à ventilation.

Dans les dépenses courantes, certains auteurs incluent, nous l'avons vu, le manque à gagner des étudiants. Nous ne l'acceptons pas pour des raisons que nous ne développerons pas ici, la principale étant que les étudiants ne rendent aucun service réel. Par contre, dans l'éducation des adultes, il faut distinguer plusieurs cas.

Lorsque l'adulte est chômeur, il n'a pas de manque à gagner, de même que lorsqu'il est sous-employé à la campagne, car sa productivité marginale est égale à zéro (s'il est retiré de la production, celle-ci n'en souffre pas), de même encore, s'il a un emploi, mais suit les cours en dehors de ses heures de travail. C'est seulement lorsque les cours ont lieu pendant les heures de travail et que l'ouvrier subit une baisse de salaire, qu'on doit inclure le manque à gagner. Cependant, le gouvernement peut subventionner l'éducation des adultes dans le cadre de son programme général d'enseignement : dans ce cas, le coût sera supporté par le budget public. Enfin, l'entreprise elle-même peut supporter ce coût si elle estime que l'éducation des travailleurs constitue un investissement rentable, un ouvrier alphabétisé devenant plus productif qu'un illettré. En fait, elle incorporera généralement cette dépense dans le prix de vente : le coût est alors transféré au consommateur.

Les calculs de productivité ont de nombreuses applications.

Ils peuvent servir à comparer deux méthodes ou techniques d'éducation ou à évaluer la modification de rendement d'une méthode lorsqu'on en modifie les facteurs : dimension de la classe, qualification des maîtres, amélioration des auxiliaires pédagogiques (manuels, équipement), amélioration du capital, c'est-à-dire de l'école et de son architecture ; on pourrait étudier, par exemple, l'effet sur l'enseignement des enfants d'une classe ouverte sur la nature et le soleil.

Les études qui ont été faites jusqu'ici et que nous avons mentionnées précédemment, se sont attachées soit au rendement physique, soit au coût monétaire (économie réalisée par la télévision), sans lier les deux. Théoriquement, le choix se fera selon l'un des critères suivants :

a) le prix de revient est moindre pour le même rendement.

b) les deux coûts sont égaux, mais le rendement est meilleur : acquisition plus rapide et plus durable des connaissances, abaissement du taux de déperdition, augmentation du nombre d'élèves et de réussites aux examens, intéressement de toute la communauté et non pas seulement des élèves, etc.)

c) le nouveau coût est supérieur à l'ancien, mais l'augmentation de rendement est supérieure à celle du coût.

L'évaluation se fera sur un échantillon représentatif ou en constituant une classe expérimentale et une classe témoin : méthodologiquement, la seconde méthode est meilleure, car elle élimine toutes les variables exogènes et ne réunit que des facteurs comparables. Si l'on veut étudier, par exemple, l'effet d'une amélioration de la qualification des maîtres, il faut que tous les autres facteurs restent constants (nombre et niveau des élèves, équipement etc.), condition qui n'est pas réalisée par l'échantillonnage.

On peut en deuxième lieu, chercher à mesurer l'évolution de la productivité d'un système ou d'un type d'enseignement donné. M. Woodhall et M. Blaug ont étudié, de ce point de vue, l'Université britannique de 1938 à 1962. [1] La "production" est mesurée par quatre indicateurs : le nombre de diplômés et de non diplômés de la dernière année d'étude; le même nombre pondéré par la durée moyenne des études (pondération "éducative"), par les gains relatifs des diplômés des disciplines littéraires, scientifiques et techniques (pondération "économique"), par les rapports inverses (pondération "culturelle"). En fait, le choix des pondérations n'influence guère la mesure finale. Dans les "facteurs" sont inclus : le temps des étudiants (mesuré par leur manque à gagner), les traitements des professeurs, les autres dépenses courantes, le coût en capital, chaque dépense étant évaluée en prix constants, et l'ensemble combiné en un indice synthétique d'après la part de chaque dépense dans le coût total des facteurs. Au cours de la période 1938-1952, la contribution du capital et du temps des étudiants a diminué, tandis que celle des professeurs et des dépenses de fonctionnement a augmenté.

(Voir tableau page suivante)

La productivité qui est le rapport entre la production et l'indice synthétique des facteurs, a diminué dans l'Université britannique depuis 1938 : en effet, la dépense a augmenté davantage que la production, ce qui signifie que le coût de la formation d'un diplômé revient plus cher en 1962

---

[1] Maureen Woodhall and Mark Blaug, Productivity Trends in British University Education. 1938-1962, Minerva, Summer 1965, P. 483-498.

TENDANCES DE LA PRODUCTIVITE DANS L'UNIVERSITE BRITANNIQUE, 1938-1962.

	1938			1952			1962		
Production	Nombre		Indice	Nombre		Indice	Nombre		Indice
Diplômés et non diplômés	18 337		61	29 957		100	42 005		140
Indicateur "éducatif"	17 789		60	29 634		100	42 520		143
Indicateur "culturel"	18 045		60	29 892		100	42 543		142
Indicateur "économique"	17 513		60	29 157		100	41 987		144
Facteurs	£ m	Part	Indice	£ m	Part	Indice	£ m	Part	Indice
Temps des étudiants	4,6	29	54	8,4	29	100	12,2	25	183
Traitements des professeurs	6,3	24	56	13,2	25	100	24,2	26	182
Autres dépenses courantes	7,7	28	62	15,2	29	100	30,5	34	152
Capital	5,2	19	54	7,3	17	100	9,2	15	145
Changement annuel dans la productivité (en %)	1938-52			1952-62			1938-62		
Production simple	- 0,8			- 2,0			- 1,3		
Production "éducative"	- 0,5			- 1,8			- 1,1		
Production "culturelle"	- 0,7			- 1,8			- 1,2		
Production "économique"	- 0,6			- 1,5			- 1,0		

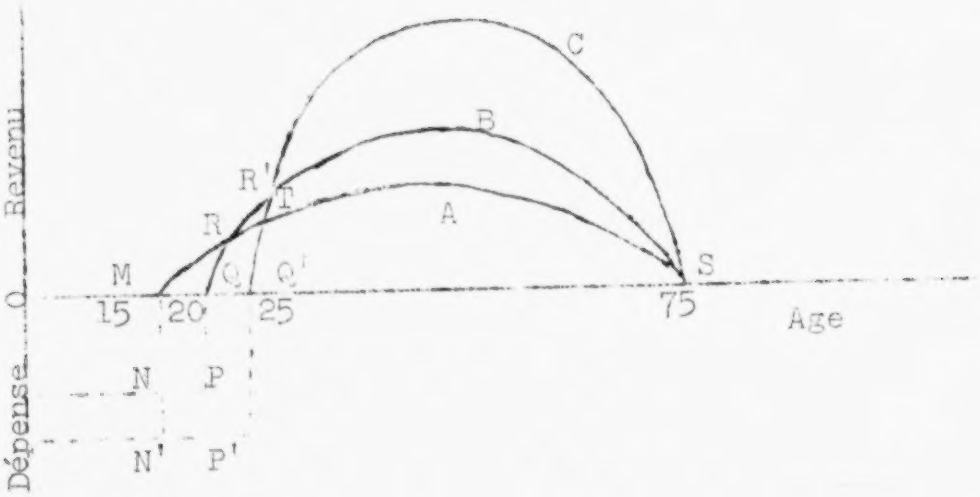
qu'avant la guerre. Certes, d'autres hypothèses sur la qualité de la production auraient donné des résultats différents, mais, en tout état de cause, il n'apparaît pas que la productivité ait augmenté, surtout dans les années récentes.

Cette tendance qui contraste avec celle qu'on rencontre dans les autres secteurs (entre 1948 et 1963, la productivité s'est élevée dans le secteur des biens de 2,79% par an et dans celui des services de 1,34%), s'explique par la diminution constante du nombre d'étudiants par professeur et de la dimension de la classe, tandis qu'aucun effort important n'est fait pour modifier la technologie de l'enseignement, pour substituer le capital au travail, en dépit de la pénurie de professeurs qualifiés. Même si l'on n'incluait pas le temps des étudiants, la baisse de la productivité serait à peine moins forte : - 1,4% par an contre - 2% entre 1952 et 1962 pour la production simple, - 1,14% contre - 1,5% pour la production "économique".

On peut comparer la productivité relative d'un allongement de la scolarité, ou celle de l'éducation d'un enfant et d'un adulte.

Sur le graphique ci-dessous, Bert Hoselitz représente les flux de revenu que perçoivent des individus selon qu'ils quittent l'école pour la vie active à 15, 20 ou 25 ans, et en admettant que tous travaillent jusqu'à l'âge de 75 ans. 1/ Le revenu croît à mesure que le niveau d'instruction s'élève, mais il faut tenir compte de l'accroissement des coûts et du manque à gagner. Ainsi, la surface délimitée par la courbe A montre le revenu total gagné pendant la vie de l'individu qui termine sa scolarité à 15 ans, le revenu à chaque âge figurant en ordonnée.

1/ Bert F. Hoselitz, Quelques réflexions sur l'économie de l'éducation dans les pays sous-développés, Tiers Monde nº 1-2, janvier-juin 1960.



Pour l'individu B, qui termine à 20 ans, il supporte des charges supplémentaires MNPQ, dont le montant doit être soustrait de son revenu total; de plus, il a un manque à gagner égal à la surface MQR, de sorte que le capital que représentent pour B ses cinq années d'éducation supplémentaires, est égal à la valeur de l'aire RASB moins la valeur de l'aire MNPQR. De même, pour un individu C qui ne commence à travailler qu'à 25 ans, son instruction supérieure lui rapporte un capital égal à la valeur de la surface TASC moins celle de la surface MN'P'Q'R'R. Chaque année supplémentaire d'éducation apporte un plus petit supplément au revenu total dans le même temps que les coûts et le manque à gagner augmentent : un moment arrive où la poursuite des études constituera une perte.

On peut, en admettant un certain taux d'actualisation, évaluer la valeur présente du revenu que procure l'investissement dans l'éducation. A mesure que l'entrée dans la vie active est retardée, ce facteur pèsera de plus en plus, car des gains plus importants dans les dernières années auront, du fait de l'escompte, une valeur présente plus faible que des gains plus bas dans les premières années. Plus le taux d'actualisation est élevé, plus le revenu actualisé est bas.

Or, dans les pays peu développés, le taux d'intérêt est très élevé, car en raison des structures économiques et sociales, on y recherche la rentabilité immédiate et le futur est déprécié. Mais, pour la collectivité elle-même, le facteur temps est essentiel, car, tout retard dans l'exécution d'un projet peut entraîner des pertes considérables (ex : une digue pour lutter contre l'inondation, un barrage pour fournir de l'eau d'irrigation et l'énergie électrique à l'industrie). Par suite l'éducation d'un adulte peut être plus profitable que celle d'un enfant, parce que l'adulte est aussitôt productif, alors que l'enfant doit attendre une dizaine d'années, même si sa vie active sera plus longue. 1/

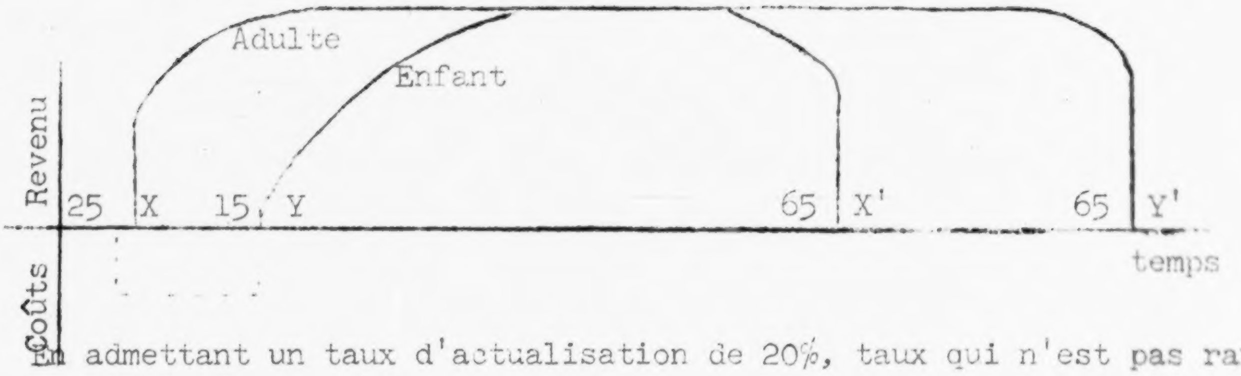
Si l'on désigne par I l'investissement, par R le revenu d'une année (1,...n), par i le taux d'intérêts, le revenu actualisé procuré par cet investissement s'écrit :

$$\bar{B} = I + \frac{R}{1+i} + \frac{R}{(1+i)^2} + \dots + \frac{R}{(1+i)^n}$$

$$= I + \frac{R}{i}\left[1 - \left(\frac{1}{1+i}\right)^n\right]$$

Prenons un adulte qui, après une année de formation, commence à travailler à 25 ans, et un enfant qui entre dans la vie active à 15 ans, après 8 années d'école. Tous deux travaillent jusqu'à 65 ans (soit une durée de vie productive de 40 et 50 ans respectivement) et reçoivent un gain annuel moyen de : 2 000 Fr entre 15 et 25 ans, 3 000 Fr entre 25 et 65 ans. Le coût d'une année d'enseignement est de 200 Fr.

1/ M. Debeauvais et Lê Thành Khôi (sous la direction de), Alphabétisation et développement économique, op. cit.; Mark Blaug, Literacy and Economic Development, The School Review, University of Chicago, Fall 1966, a insisté sur l'importance du taux d'actualisation.



En admettant un taux d'actualisation de 20%, taux qui n'est pas rare dans les pays peu développés, et en appliquant la formule précédente, le revenu actualisé de l'adulte s'élève à :

$$\bar{X} = -200 + \frac{3\,000}{0,20} \left[1 - (\frac{1}{1,20})\ 40\right]$$

$$\simeq -200 + \frac{3\,000}{0,2}$$

$$\simeq 14\,800 \text{ Fr}$$

Pour l'enfant, il faut actualiser à la fois le revenu et le coût (puisque nous nous plaçons au moment où l'adulte devient productif) :

$$\bar{Y} = -200\ (\frac{1,20}{0,2}) \left(1 - (\frac{1}{1,2})^8\right) + \frac{2\,000}{0,2\ (1,2)^7}\ (1 - \frac{1}{1,2^{\ 9}})$$

$$+ \frac{3\,000}{0,2\ (1,2)^{17}}\ (1 - \frac{1}{1,2^{\ 39}})$$

$$= -920 + 2\,250 + 676 \text{ Fr}$$

$$= 2\,006 \text{ Fr}$$

Ainsi, le revenu actualisé de l'adulte est plus de 7 fois supérieur à celui de l'enfant parce qu'il travaille 7 ans plus tôt et parce que le taux de l'intérêt est très élevé dans les pays sous-développés.

Même en admettant un taux de 10%, la rentabilité de la formation de l'adulte reste supérieure, car on obtient respectivement 14 500 Fr et 10 616 Fr, soit une différence de près de 4 000 Fr en faveur de l'adulte. L'écart diminue à mesure que l'âge de l'adulte s'élève et si l'on admet que le revenu moyen de l'enfant sera supérieur à celui de l'adulte, grâce à son éducation de base.

Finalement, les calculs de productivité peuvent servir à comparer l'investissement intellectuel et l'investissement physique.

Aux Etats-Unis, Gary Becker a évalué le taux de rentabilité de l'enseignement supérieur, défini comme le taux qui égalise le coût total moyen de l'enseignement supérieur (y compris le manque à gagner) pour un étudiant et la différence moyenne de revenu, avant impôt, entre un diplômé de l'Université et un diplômé de l'enseignement secondaire. Après différents ajustements pour tenir compte des aptitudes individuelles, de la race, du chômage et de la mortalité, Becker obtient un taux de 9% pour la population masculine blanche des villes, en 1940 et 1950 ; pour les autres groupes de la population américaine, il est plus bas. Ce taux est légèrement plus élevé que celui de l'investissement matériel, estimé à 8%. Becker n'évalue que la rentabilité directe, les bénéfices sociaux de l'éducation ne lui paraissent pas comparables. 1/

1/ G. Becker, Under-Investment in College Education ? American Economic Review, May 1960, P. 346-354. Le taux serait plus haut sans le manque à gagner.

GUIDE FOR A FINANCIAL ANALYSIS OF THE EDUCATIONAL SYSTEM

by Fernando de Escondrillas

CONTENTS

Page

A. Structure of income III - 1

1. Identification and classification of financing sources III - 1

2. Study of the potential of each financing source III - 2

3. Utilization of the financing sources III - 4

B. Structure of expenditure III - 7

1. Distribution of expenditure by services III - 7

2. Distribution of expenditure by items III - 12

C. Analysis of costs and operation III - 14

1. Average costs III - 14

2. Deviations from average III - 16

3. Physical elements of cost III - 16

4. Setting of standards III - 18

5. Cost estimates III - 19

A. Structure of income

1. Identification and classification of financing sources

The sources for financing education may be classified in the following four sectors:

(a) Public Sector, in which the following would be included:

- (i) National or federal income
- (ii) Provincial or state income
- (iii) Municipal income

The manner in which the above contribute to education may be:

- (i) direct appending in education and/or
- (ii) transfer of funds to the institutions which directly provide the services.

(b) Business Sector, whose contribution could be:

- (i) Voluntary or compulsory, to the institutions which provide educational services
- (ii) Payments to educational institutions in return for research or educational services, or merchandise produced by such institutions
- (iii) Loans granted to educational institutions for investment purposes, either in terms of money or sales on credit.

(c) Family Sector, formed by the incomes of families, and whose contribution could be:

- (i) Payment for educational services
- (ii) Voluntary contributions to the educational institutions either in money or in kind (goods and/or services).

(d) External Sector, whose form of contribution to educational expenses could be:

- (i) Technical assistance, which is difficult to evaluate in such a way as not to throw out of balance the conclusions of the analysis
- (ii) Donations
- (iii) Credits made available to educational institutions.

2. Study of the potential of each financing source

The contribution of each source to educational expenses will be in direct relation to its total volume of resources, and in opposite relation to the volume and cost of activities in either fields.

It is necessary to estimate as accurately as possible the maximum limit of contributions from each source, by the most appropriate methods in each instance.

(a) As regards the public sector, the percentage of resources which the country, province or municipality should set apart for education cannot be determined from the educational standpoint. The analysis of possibilities should be made jointly with over-all planning offices, in order to be in possession of all the background information necessary.

(b) As regards the business sector, its capacity to contribute to education can only be estimated indirectly. The amount which could be obtained can be estimated, taking into account the sums spent on publicity, social assistance, sports, etc.

(c) In the family sector, an investigation should be carried out to determine the capacity of contributions from family incomes. This will depend on their total volume and distribution and on the extent to which the society is convinced of the personal benefits of education.

Such investigation should also show:

(i) The number of families (AF) whose incomes are below subsistence level (Aa), and who even require economic assistance in order to educate their children.

(ii) The number of families (BA) whose incomes do not permit any contribution to education, and whose education must be wholly free.

(iii) The number of families (CB) whose incomes permit the payment of part of the costs of education, and

(iv) The number of families (OC) whose income permit full payment of their children's education. (Figure 1.)

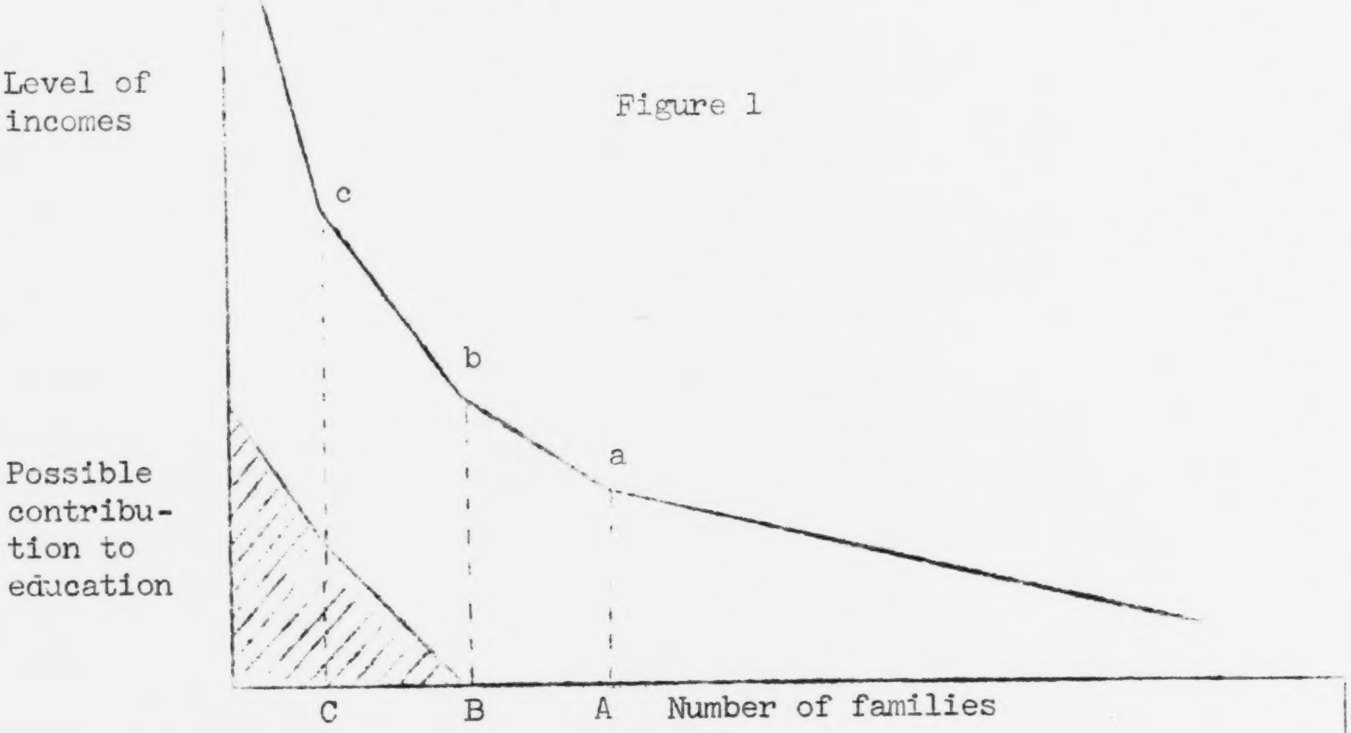


Figure 1

Table 1

Sources and concepts	Contributions to entities which provide educational services					
	A	B	C	D	E	Total
Public Sector						I_1
Central Government Direct Costs Transfers						I_{11}
Provinces Direct Costs Transfers						I_{12}
Municipalities Direct Costs Transfers						I_{13}
Business Sector						I_2
Contributions Payments for services Available credit						
Family Sector						I_3
Payments for services Contributions						
Internal revenue						I_I
External Sector						I_4
Technical Assistance Donations Credit						
TOTAL INCOME	I_A	I_B	I_C	I_D	I_E	I_T

(d) As regards the external sector the possibilities of contribution is an actual amount stated, since the volume of assistance under programmes of international organizations, agencies, foundations and credit institutions is clearly stipulated. However, as regards credit, a limiting factor of an external character exists, namely the country's capacity of external indebtedness.

3. Utilization of the financing sources

An analysis of the utilization of financing sources consists primarily in determining the measure in which the possibilities of each source are made use of, and secondly, the methods followed to obtain such resources. (Table 1.)

(a) If the available information is set out in a general educational income table in which the contributions of the financing sources to the different entities are indicated horizontally, and the incomes of such entities vertically, as shown in Table 1, the following may be obtained:

(i) Measure of the financial effort of the country directed towards education, as expressed by the ratio of gross national product to internal income (I_I)

(ii) Measure in which each source contributes to education, expressed by the ratio of potential to actual contribution ($I_L = 1,2,3,4$)

(iii) Measure in which each unity obtains finances from each source, expressed by the relation between the total contribution made by the source and the contribution received by the entity. A standard of measurement must be established which would make possible an objective assessment of the quality of resource distribution between the different entities, in accordance with the source, the form of contribution, and the volume of services provided by each entity.

Although from a methodological standpoint Table 1 appears as the starting point of the analysis, the scarcity of information available in Latin American countries is such that a series of estimates will have to be made; this can only be done when the analysis has reached a more advanced stage.

(b) The anomalies which emerge when carrying out measures ii) and iii) above can be explained by an analysis of the methods used by the entities for obtaining funds, and the criteria these financing sources have for the distribution of resources.

(i) When analysing the utilization of resources from the public sector the criteria explicitly or implicitly established to determine the volume of transfers to the different entities, in which are reflected the existence of pression of the different groups in power or of the entities themselves, must be known.

(ii) As regards the business sector, the following will have to be analysed:

(1) The legal measure which require enterprises to contribute to the financing of education; evasion of this obligation, resorted to on a large scale in Latin American countries, is primarily due to the fact that non-observance is provided for or permitted under existing legislation. The main characteristics of an efficient compulsory measure is the extent to which it simplifies:

- Identification of the commitment
- Determination of its size, and
- Collection of the contribution

(2) The legal measures which stimulate business contributions to education.

(3) The actual or potential ability of the educational entities to sell products or services to the business world, and the methods followed in this respect.

(4) The actual ability of educational entities to use, free of charge, certain services or products (e.g., publicity materials) as an element of providing educational services. The lack of specific proposals on which to negotiate such contributions, is the chief reason why this source is so little used in most of the countries.

(5) The ability of the different educational entities to use sources of credit, taking into account the cost of money and the capacity of indebtedness of the entities concerned.

(iii) As regards the methods for obtaining resources from the family sector, the following should be analysed:

(1) The criteria applied by each entity in determining the size of matriculation or tuition fees in the different levels or branches of education. In certain instances, as interpretation of the principle of equal opportunity for all, provides for free education at all levels without taking into consideration the possibility of a contribution to the costs of education by the student or his family, together with the moral obligation entailed by the naturally privileged situation of reaching a post obligatory level in the Latin American countries.

(2) The measures established to stimulate family contributions to the costs of education. Even though these measures are weak and not very encouraging, the truth is that family contributions in money or kind (goods or services) are important in the Latin American countries. Paradoxically, the contribution is given to the level of education which, under the constitution, should be free of charge, instead of to higher levels which are not cost-exempt by law.

The essential conditions to increase the voluntary family contributions are:

- Quality and efficiency of the services
- Public knowledge and support of the action programmes
- Enlightenment of the public regarding the ways of helping the development of educational programmes.

(iv) The methods of obtaining external aid or credit are clearly specified in each instance. Therefore all that has to be done is to determine whether they are being followed. As a rule, it is because of the lack of specific projects on which to base negotiations for external aid, that so little use is made of this source.

B. Structure of expenditure

The second step of the financial analysis is to determine the use which the different educational entities make of the resources obtained. This means analysing, in each entity, the distribution of resources among the different services, and, in each service, the distribution of expenses by item.

1. Distribution of expenditure by services

An analysis of the distribution of expenditure between the different services of an entity entails the following fundamental steps:

- Identification of the services and of the amounts assigned to them
- Judgement regarding the distribution of expenses
- Explanation of the causes of such a distribution

(a) The services may be classified into the following groups:

(i) Administrative services, which would include all services which cannot be directly attributed to educational activities as such and which are:

- Direction
- Supervision
- Personnel administration
- Budget administration

(ii) Cultural services, which may or may not collaborate with the educational service, such as:

- Libraries
- Arts
- Sports

(iii) Social assistance services, which, even though they may be attributed to specific educational services, would distort the analysis not only because they do not cover all the customers of the service but also because they do not constitute in themselves a true educational expenditure.

(iv) Educational services, in which it is desirable to separate the level or branch of education as well as to make any other convenient breakdown:

- Primary education
  - Rural
  - Urban
- Secondary education
  - General
  - Agriculture
  - etc.
- Higher education
  - University
  - Non-university

(b) In order to judge the distribution of expenses between the different services, an ideal distribution standard must be available, which has to be prepared in each instance, and in which account is taken of both the volume of customers and the weighting factors, considered advisable in the light of the characteristics of the different services. A determination should first be made regarding the balance between the expenses of the four major groups:

- Administration
- Culture
- Social Assistance
- Education

and it is here that an ideal determination is a more complicated matter because of the absence of theoretical rules on what should be spent for any of these items in relation to the total.

Administrative costs, for exemple, are partly fixed, regardless of the size of the entity, and partly variable, depending upon the volume of the other services; as a result, a small entity may consider as normal a percentage of total expenses which may, from every point of view, appear disproportionate in a large-sized entity. On the other hand, the variable costs in a supervisory service do not increase at the same rate as in a budget administration service. This shows us that the composition of the group of services must also be considered in determining the rule or standard.

The character of the different cultural services (for the public at large or for limited groups) will give some indication as to the importance which should be attached to this type of expenditure in relation to the total, and taking into account the importance and magnitude of the problems dealt with by the other services.

As regards social assistance services, the investigation on family incomes, already referred to, provides an indicator of needs. The volume of customers of the educational services whose family incomes are below subsistence level will show how large the social assistance services of the entity should be. On the other hand, it would be advisable to analyse whether, given an adequate volume of expenditure on assistance, the funds concerned are actually spent on the group truly in need of assistance.

The second determination, and probably the most important one, judging from the volume of expenses involved, concerns the adequate distribution of expenses among the various educational services.

The standard measure should be determined in function of the volume of customers and the relative cost, considered adequate, for each service. If a system of standard costs is available, these costs should be used, although recourse to international comparisons would be the normal procedure.

To establish a standard measure of the distribution of expenses between the educational services A, B, C, D, --, of an entity, consideration must be given to matriculations Ma, Mb, Mc -- of said services and the ideal unit costs of each service Ca, Cb, Cc -- expressed in function of the cost of one of them:

$$1, \quad \frac{Cb}{Ca} = b' \qquad \frac{Cc}{Ca} = c', \quad ---$$

The ideal percentage of expenses for each service would be expressed by:

$$\frac{n' \; Mn \; : \; 100}{T} \text{ , taking}$$

$$T = Ma + Mb + \ldots \text{ and therefore}$$

$$100 = \frac{Ma \cdot 100}{T} + \frac{b' \; Mb \cdot 100}{T} \quad \ldots.$$

A comparison between the theoretical and actual distribution in the way indicated in Table 2, makes it possible to determine whether the distribution is appropriate or not. An attempt has been made to measure appropriate distribution of public sector educational costs among the different levels of education in some Latin American countries. The weighting factor used is the ratio of secondary and higher education costs to primary education costs in the USSR and the countries of OECD.[1]

Table 2

Service	Standard measure	Actual distribution	d	d^2	$S_r^2 = \frac{d^2}{n}$	S_r
A						
B						
C						
D						
-						
-						
-						
	100	100				

---

[1] Can the financial bottleneck in the educational development of Latin America be eliminated? Seminar on Problems and strategies in the Educational Planning of Latin America, Paris 6/IV - 9/V - 1964.

The results of such measurements, as an example, are given in Table 3.

Table 3

Quality of distribution of expenses by levels of education in some countries

Countries	Levels	Theoretical standard	Actual distribution	d	d^2	$S^2_r = \frac{d^2}{3}$	S_r
Argentina	P	52.1	51.5	0.6	0.36	5.66	2.3
	S	31.5	30.2	1.3	1.69		
	H	16.4	18.3	-1.9	3.61		
Colombia	P	70	51.8	18.2	331.24	166.34	13
	S	24.6	31.9	-7.3	53.29		
	H	5.4	16.3	-10.9	114.49		
Ecuador	P	74.2	59	15.2	231.04	144.56	12
	S	19.6	20.3	-1	1		
	H	6.5	20.7	-14.2	201.64		
El Salvador	P	77.6	76.1	1.5	2.25	42.75	6.5
	S	19.6	12.5	7.1	50.4		
	H	2.7	11.4	-8.7	75.6		
Honduras	P	84.2	81.2	3	9	9	3
	S	12.1	16.2	-4	16.81		
	H	3.7	2.6	1.1	1.21		
Mexico	P	76.8	66	10.8	116.64	63.92	8
	S	16.2	18.7	-2.5	6.25		
	H	7	15.3	-8.3	68.89		
Peru	P	68.1	54.8	13.3	176.89	89.05	9.4
	S	23.6	29.3	-5.7	32.49		
	H	8.3	15.9	-7.6	57.76		
Venezuela	P	69	49.2	19.8	184.96	205.15	14.3
	S	22.5	28.7	-6.2	38.44		
	H	8.5	22.1	-13.6	184.96		

(c) For a proper understanding of the cost structure, more is needed than a measure of the quality of cost distribution. The reasons why such a distribution has resulted must be sought. In doing so, at this stage, the criteria used for the apportionment of resources to the different services at the time of working out the budget should be analysed.

If there are no cost standards and the budget is prepared without the cooperation of the executive organs of the entity, the distribution must naturally be arbitrary as it is based on subjective appreciations of the author of the draft budget. It is also much easier for pressures to be brought to bear by some services for the purpose of obtaining more funds.

2. Distribution of expenditure by items

Expenses in each service should now be analysed.

The first step would be to analyse the distribution of expenses between the different items included in the budgets or accounts, grouped together as follows:

- Personal services
- Non-personal services
- Supplies (expendables)
- Construction
- Endowment (non-expendables)

The first three are operating expenses of the service in question and the last two are capital expenses.

It is impossible to suggest fixed standards for an adequate distribution by items, as such a distribution depends on the way in which the service is provided and on the programmes for its expansion. It will be necessary, in each instance, to establish a standard distribution as a function of the standard provision of the service, or, in its absence, as a function of ideal standards or specific examples from other countries.

If the information available is sufficiently detailed, the analysis may be effected taking into account the following classification of expenses:

- Investment
  in which a distinction should be made between the construction or endowment that replaces or completes the installed capacity of the service, which may be classified as replacement costs, and construction and endowment which constitue costs of enlargement of the given capacity.
- Operating expenses
  in which a distinction should be made between administrative costs, maintenance costs and educational costs.

In order to determine an adequate allocation for replacement costs there is no better yardstick than the actual requirements of the service in terms of buildings and equipment. Apart from the necessary cost analysis of the construction solutions adopted, and of the prices of the endowment in relation to the prevailing conditions in the country, an idea of their adequacy can be obtained from the time taken to meet requirements with the allocation received.

As regards the enlargement costs of the installed capacity, the standard of judgement is determined by the relation between enlargement costs and operating expenses, and the ability of the system to meet the needs of the new installation. The possibility of dealing with the newly-installed capacity or putting it into service may be measured in real terms - the extent to which the new schools can be placed in service given the number of school teachers produced by the educational system - and in financial terms - the extent to which the new schools can be placed in service, given the funds normaly allocated for this purpose. This leads to a comparison of the different types of investment which may be made in order to increase operating capacity, and to an evaluation of this investment in terms of its effectiveness not only from the point of view of increased volume of customers served but also from that of the human and financial resources required for its operation.

As regards the analysis of the operating expenses, standards are available or may be determined with which to relate maintenance costs to the volume of investment affected. This could help to assess the adequacy of the allocation. Maintenance costs are, or should be, in proportion to the volume of construction and equipment belonging to the educational service, and form a part of the fixed costs thereof.

Administrative costs also constitute fixed costs of the service and their size is in relation to the number of operating units in the service. It is not possible to suggest standards of measurement with which to judge an adequate relationship between these fixed costs and the variable costs, consisting of educational costs. A thorough cost analysis is necessary to determine the adequacy of the allocation for administrative costs.

C. Analysis of costs and operation

The aim of cost analysis is to achieve cost control through the discovery of organizational shortcomings and defective methods and procedures used in carrying on an activity.

Cost analysis should be a continuous activity of educational administration intimately related to organization and methods.

In order to effect a diagnosis of the educational situation, the following is a suggested guide for an analysis to be carried out in each service:

1. Average costs

The first indication regarding the functioning of a service may be found from the figures of averages, out of which the following are of greatest interest:

(a) Yield of the service, measured by the relation between the activity performed and the results. The indicator which is easiest to obtain is the relation between the total volume of matriculations and that of graduates (egresados), which would measure the number of students-year which must be educated to produce a graduate.

$$R = \frac{M}{E} \qquad (1)$$

The standard of measurement would be the yield figure in a normal system where no repetition or desertion takes place.

$$r = \frac{(1 + t)^n - 1}{t} \qquad \text{in which}$$

t = rate of increase of matriculations

n = number of years of study

(b) Cost per student-year expressed by the relations between operating costs (G_F) and the number of students

$$Ca = \frac{G_F}{M} \qquad (2)$$

The standard of measurement would be that established in accordance with the methods of work used to provide this education. Where there is no such standard, an idea of the adequacy of the cost per student in terms of what the country can afford, would be obtained by comparing the cost with the relation between the ideal theoretical allocations to the service (Table 2) and the number of persons it must serve.

(c) Cost per graduate expressed by the ratio of operating costs to the number of graduates.

$$G_E = \frac{G_F}{E} = R \cdot Ca$$

(d) Structure of the matriculation. The composition of the matriculation by academic years, which is a function of yield, and therefore influences the costs per graduate, may provide much information regarding the quality of the provision made for the service. This may be expressed by

$$I_E = \sqrt[N]{M_1 \cdot M_2 \cdot M_3 \cdots M_n} \qquad \text{in which}$$

I_E = Index of structure

n = Number of years of study

$M_1 + M_2 + M_3 \ldots + M_n = 100$

M_i = Percentage of total matriculation in year i.

The ideal theoretical figure with which to evaluate the indicator obtained would be:

$$i = \frac{100}{n}$$

2. Deviations from average

A more accurate idea of the situation of the service, as regards structure, yield and costs would be obtained by analysing the deviations from average shown in the different establishments, zones or areas. This study may be established by means of a sample, whenever the number of establishments is unduly large. Only in the case of major deviations from average should an analysis be made of the causes of deviation, which could be:

(a) Differences in the cost of manpower and materials used;

(b) Differences in the organization of the education - large concentrations or small units - and in the methods of work;

(c) Factor alien to the service such as: dispersion of the customers, attitude towards education, economic conditions, etc.

3. Physical elements of cost

So far, the analysis would be carried out as a function of the product of education and of its customers, without providing a very clear idea of the service. The above may be sufficient in order to measure results, but the main function of diagnosis is to serve as a base for future programming, and for this the analysis must be made from the standpoint of the functioning of the service. To this end, the following would be required:

(a) Identification of the different types of service units used, a unit being taken to mean one which carries out a complete service. The following can be taken as examples:

- In primary education: one-classroom schools, two-classroom schools, schools with four grades, graded schools with 6, 10 and 20 classrooms.

- In secondary education: colleges or high schools with 6, 10 or more grades, full time, half time, teaching by correspondence, radio, or television, etc.

(b) Identification of the different operative units which make up the service unit. An operative unit is deemed to be one which carries out a group of activities directed towards achieving a partial aim of the service, such as the teaching of a grade or subject, administration, printing and distribution of teaching material, etc.

(c) Determination of the cost of each operating unit in terms of:

(i) Volume of work included in carrying out the activity in question, measured in hour/years, man/years or any unit considered more convenient.

(ii) Volume of non-personal services expressed in the unit corresponding to each service received (telecommunications, post, electricity, water, etc.).

(iii) Volume of expendables used by the unit in the performance of its activities.

(d) Analysis of the costs thus determined, as a function of the ideal or established standards, on the utilization of the three factors mentioned. It is advisable to limit the analysis to the factor which is really important in the fulfillment of the activity, [illegible] which there is reason to believe, is put to least advantageous use.

The comparison between the work included and that which would be necessary with a suitable distribution of matriculations or activities, indicates the waste incurred in that factor. As an example, a comparison made in a Latin American country between the hours of work needed in secondary education and that which would be necessary if, for example, it were considered convenient to group together students in classes of approximately 60 students, is given below:

Table 4

			Weekly hours of work			
	Students	Groups necessary	Necessary (1)	Budgeted (2)	Waste (2)-(1)	Percentage
Secondary	220 000	3 666	73 320	106 184	32 864	31
Industrial	52 628	1 000	20 000	39 853	19 853	49,8
Agricultural	5 841	100	2 000	9 337	7 337	78,6
Commercial	20 049	335	6 700	15 677	8 977	57,3
Totals	298 518	5 101	102 020	171 051	69 031	40,4

If, instead of 60 students, classes of 50 (A) or 40 (B) students are deemed suitable, the total results would be:

(A)	the	5 970	119 400	the	51 651	30,2
(B)	same	7 462	149 240	same	27 811	16,3

It is necessary to revise the causes which determine the improper use of the factors and media in order to correct their influences.

4. Setting of standards

The aim of setting standards is to have the necessary basis on which to control costs and operations, which should begin as soon as a plan starts to be implemented. Therefore, not only should standards be set for the functioning of the operative units actually in use, but also for those operative and service units which may be used in the future.

In the determination of standards account must be taken of the analysis of costs and operations carried out as well as of teacher-training requirements. The former show the real limits which the standard is to serve, and the latter indicate the acceptable limits in the quality of the service.

The steps in the process would be:

(a) Establishment of standards of utilization of the different factors in each operative unit, and its corresponding valuation at market prices in order to obtain the standard cost in terms of money.

(b) Study of the different groupings in which the operative units may be assembled in order to obtain different types of service units. The study and determination of the different types of service units must be made in terms of obtaining the maximum utilization of resources.

(c) Study of the minimum and optimum size of each type of service unit as a function of the number of students served and determination of the standard costs in terms of money for each type.

This part of the analysis will make it possible to establish the type of service unit which should be created as a function of the customers it should serve.

5. Cost estimates

With cost estimates, the constructive part of the analysis is embarked upon fully, since what is sought is to determine the cost of achieving the aims by using the different units of service, for which the standard costs have been obtained.

The aims of the estimate may be summarized as follows:

(a) To judge the desirability of establishing a programme, or a method of service; e.g. educational TV.

(b) Comparison of the cost of the different methods.

(c) To establish the points of reference for allocating funds to determined costs; e.g. subsidies.

(d) To establish the fees which should be charged.

(e) To judge the desirability of executing the activity in question directly or of contracting for such service.

(f) To facilitate the task of programming the service.

PART B METHODOLOGIES

UNIT COST CONCEPTS AND STATISTICS REQUIRED FOR AN ANALYSIS OF EDUCATIONAL PRODUCTIVITY

by Jean-Pierre Gern

CONTENTS

		Page
I.	Concepts of educational productivity	IV - 1
II.	Concepts of unit cost	IV - 4
III.	Statistics required for the study of unit costs	IV - 9
	(a) Statistics relating to the cost of education	IV - 9
	(b) Other statistics required	IV - 11
IV.	Analysis of unit costs	IV - 12
	1. Factors tending to explain differences observed in various components of the unit cost	IV - 13
	(a) Teacher cost	IV - 13
	(b) The cost of teaching materials	IV - 13
	(c) Cost of operating school buildings	IV - 14
	(d) Cost of upkeep of the buildings	IV - 14
	(e) Administrative costs	IV - 14
	(f) Cost of related services (or social expense)	IV - 14
	(g) Cost of the use of buildings and equipment	IV - 15
	2. From differences in cost to differences in productivity	IV - 15
V.	The use of unit cost comparisons for the analysis of productivity	IV - 19
	1. Comparisons between different methods of training with a country	IV - 20
	2. International comparisons	IV - 25
	3. Comparisons with a standard	IV - 25
VI.	Conclusions	IV - 26
	Annex	IV - 31

1. In every kind of production, there is always a ratio between unit cost and productivity, and a rise in the productivity rate corresponds symmetrically to any decrease in the unit cost. The question with which we are now faced is the following : To what extent will the study of unit costs in education enlighten us as to the productivity of the institutions or school systems concerned ? There are undoubtedly many different ways to define "unit costs" and "productivity", and it is important therefore that we should first consider the various definitions which are proposed.

I. Concepts of educational productivity

2. There are many different definitions of educational productivity - from those given by the economists, who are chiefly concerned with the effect of the investment in manpower on the gross national product, to those given by the educators in their concern for pedagogical efficiency. It is possible to consider education from different points of view, and yet they must all converge, to a certain extent, towards the ultimate target of the growth of economic production together with social and cultural development. Ideally, educational productivity could be difined as "the ratio between the contribution made by education to general development and the cost of education". The contribution made by education to the achievement of the most desirable future for the human race implies not only that education must be pedagogically efficient, economically profitable, etc., but also that in its aims, its methods and its structures, it must meet other requirements which reflect the complexity of the purposes of education (because it affects - in a way which unfortunately is not fully known - the course of all the structures of civilization).

3. In comparison with that ideal concept of productivity, the instrumental concepts which we can use are only partial approaches, devoid of any absolute value, but which can usefully supplement one another. These instrumental concepts of productivity are partial in two respects :

- In the first place, they envisage the productivity of education only from certain points of view :
  - pedagogical efficiency;
  - output (meaning the percentage of pupils or students who complete a given cycle of schooling);
  - economic productivity.
- In the second place, they measure productivity only in proportion to a certain type of resources :
  - either the material and human resources allotted to education,
  - or the financial resources necessary for the mobilization of the former.

4. Each of these points of view (and others too) merits our attention, and one or another warrants special consideration according to the economic situation of the country concerned. We shall, however, focus our attention on only one of these approaches - for two reasons:

(a) To cover them all would involve us in far-reaching and intricate problems.

(b) It is doubtful whether computations of financial productivity (minimum cost of the production unit or maximum yield of the investment unit) are the most adequate instrument for weighing the advisability of devoting certain human or material resources to education rather than to other sectors. Only within the framework of general planning and the organization of all related activities is it possible to judge the advisability of assigning certain human and material resources to education. Technically the only valid optimum is that of the whole, and, from a practical standpoint, computations worked out in terms of physical resources are apt to be more effective than those attempted in terms of money.

5. We shall therefore limit the discussion to the following issue: How shall we measure the productivity of public expenditure for education (including, where appropriate, of similar private expenditure)?

6. W.A. Lewis quite aptly remarked that the results of education depend at the same time on its quality and its fitness. It cannot therefore be measured only by the amount of knowledge acquired or by examination levels, but it is also necessary to take into account the utility of that knowledge in the socio-economic environment or, to put it more exactly the efficiency of the training received for active integration into that environment. An additional problem arises, says Lewis, in connexion with fitness - namely that the purpose of education is to change society and not merely to become adapted to it.[1] To measure its efficiency in terms of that target would be undoubtedly the most significant thing for most developing countries if it were measurable. In fact, we are unable to conceive and compare the alternatives of development - and by what standard should they be compared ? Admittedly, as J. Austruy remarks, development is, to a large extent self-determined[2], i.e. it determines the standards by which it is to be measured.

---

[1] Economic Aspects of Quality in Education. IIEP 1966 p. 2

[2] Le Scandale du développement. (The Scandal of Development) Paris 1965 p. 199

Hence the value of any concept of educational productivity is a relative one; it measures the contribution of education to a certain type of development, not the effect of education on the trend of development (although that is not its least contribution).

II. Concepts of unit cost

7. The unit cost can be defined as the cost of an educational unit. This raises two questions :

(a) What is an educational unit ?

(b) What cost components are to be considered ?

8. Ideally, the educational unit should be defined as "the ability acquired by the educated to participate in the development of the economy and of civilization".

9. If it were possible to measure the results of educational activities on the basis of that ideal definition and to compare that measurement with the ideal concept of productivity suggested in paragraph 2, the relationship between productivity and unit cost would be simple, and the yardstick of unit cost could be used as the expression of educational productivity. But we do not have at our command those necessary instruments of measurement and must therefore rely upon partial definitions of unit cost.

10. These definitions of the educational unit disregard the "fitness" aspect. One of them takes the "quality" aspect and measures the results of the educational effort, the graduate or diploma-holder himself being taken as the educational unit. Education's contribution to the pupils who do not obtain the diploma, but whose schooling is generally not by any means an entire loss, is disregarded. Moreover, that method of measurement

depends closely on governmental promotion policy and on possible fluctuations and differences in examination levels, and special tests can be carried out in order to measure more accurately the results of the educational effort.[1]

11. The following definitions disregard both fitness and quality and consider the educational unit as being only the unit of educational effort. They are not, however, without value for the analysis of educational productivity. The most general definition of the unit of educational effort is the enrolment unit, considering when required the length of the school year (taking into account the number of hours of schooling per day and the number of days per year)[2].

12. It may also be worthwhile to make partial measurements of the educational effort by taking as a unit either one element of cost per pupil (e.g. cost of books or equipment per pupil) or the cost of a unit of one of the inputs of education (cost of a teacher or cost of one square meter of classroom).

1. Cost factors to be considered

13. We have just mentioned various "units" of which it may be useful to compute the cost. Cost factors to be taken into consideration are not necessarily the same from both of the standpoints we have referred to.

14. We explained in paragraph 3 why we were confining ourselves to an analysis of the cost from the standpoint of public financing. The cost concept which we are adopting therefore closely approximates a public expenditure concept. It differs, however, for reasons brought out in the following paragraphs:

---

[1] C.J. Hallak: Coût, rendement et efficacité des systèmes d'enseignement (Cost, yield and efficiency of educational systems) IIEP 1966 pp. 12-14

[2] Fr. Edding: Methods of Analysing Educational Outlay. Unesco 1966, pp. 13-14. Edding explains the use made in the United States of Average Daily Membership and Average Daily Attendance.

15. (a) Certain expenses which are sometimes covered by the national budget are also sometimes borne by local authorities or families. To the extent to which our purpose is the optimum use of the financial governmental resources, it would appear that we might disregard, if not both of these two additional categories of expenditure, at least the second. But as a matter of fact, while it may be advantageous to separate these three categories of expense, we nevertheless cannot afford to disregard any of them, especially since the distribution of educational expenditure fluctuates and tends in general to devolve upon the State[1/].

16. (b) We must not overlook, either, the part of the educational cost which is financed from abroad. In fact, international co-operation makes cost analysis more complex, because the services provided by a foreign country usually prove to be much more expensive than similar services provided by the country itself. Services provided by foreign aid should therefore be isolated and handled separately in the cost analysis with an effort to estimate what the cost of similar services would be if provided from local resources[2/]. Should it be considered that such services are expensive to the Government and that this high expense should therefore be counted as a factor in the cost of education to the public finance? It could be admitted that that question should be answered affirmatively if the foreign aid could have been used alternatively for other purposes, but negatively if the aid is accorded specifically for education.

[1/] A. Garcia: The Financing of Education under a Centralized System. France. In OECD Financing of Education for Economic Growth, 1966 pp. 158-159

[2/] Cf. on this point L. Cerych. External Aid as a Source of Financing Educational Expenditure: Some Problems of Evaluation. Para. 9-15

17. (c) The cost of education in private institutions also deserves to be analyzed, whether it be because of subsidies granted by the State, for purposes of comparison only, or in order to define the future role to be assigned to the private sector.

18. (d) The annual cost does not always reveal the real cost of education. That is why, for example, a Government may prefer to grant teachers an improvement in retirement benefits rather than an immediate salary increase, because it does not affect the budget for the current year nor even for several years ahead. In order to compute the actual cost of education for any given year, it will be necessary to account for the retirement reserve which the Government would have to set up in that year for financing the eventual retirement of the teachers after their active years, less pensions paid during that year to teachers already retired.

19. (e) Capital expenditure. It may be of interest to analyse investment costs and work out comparative costs per pupil, per classroom or per square meter in different types of construction. We will not dwell upon the techniques of building cost analysis, which are now quite well developed. The problem which will claim our attention is that it does not suffice to make analyses of investment expenditure and of operating expenses independently from one another. We must in fact take into account the life of the buildings, which determines the cost of their usage, and the numerous inter-relationships existing between capital expenditure and operating expense. For this purpose the annual cost of using the investment property (buildings, equipment, etc.) must be computed. It would only be necessary to divide the capital expenditure by the number of years the buildings and equipment are used, if there was not the problem of interest. As our analysis is in terms of public finance,

we can refer in this connexion to the average rate of interest on Government loans. The way to compute the annual cost allowing for interest is shown in the study by J. Hallak entitled "Cost, Yield and Efficiency of Educational Systems", IIEP 1966 p. 10. This formula (taking into account the length of time each building or item of equipment is used) is applicable to all capital investment regardless of how it is financed. Whether or not the Government actually issues bonds or a loan makes no difference from the standpoint of cost analysis. That is why we must also exclude from our analysis any expense relating to the servicing of the debt.

20. (f) Value of the land. If we apply to the use of the sites occupied by the schools the same rules as for building and equipment expenditure, we will include only an amount equivalent to the annual interest on the value of the ground. A question may however arise when urban development and perhaps land speculation make land prices soar rapidly. It is true that from the viewpoint of public finance, the alternative yield of the ground may be very high (renting it for the construction of buildings for commercial use, for example); but from the point of view of economic analysis it is not certain that there is really a utilization of resources of any such price[1], and taking the high price of land in towns and cities as a yardstick to determine the best location for schools could lead planners to make unfortunate decisions.

---

[1] While traditional economic theory teaches us that land in urban areas constitutes a scarce resource the value of which is therefore high it must be noted that the total amount of these scarce resources depends on their being used (e.g. the expansion of the urban area). The additional use of the available land is immediately offset by an increase in the amount of these scarce resources, as the costly land area constantly expands.

21. (g) Tax exemptions granted to private educational institutions. Whatever the basis on which they are levied (real property, capital, etc.), taxes are paid on income derived from current production; it therefore seems meaningless to say that the State looses the tax on real property used for education.

22. (h) Moving and travel expense. In an analysis of the cost of education as a user of available national resources, only a part of moving and travel expense can be included (expense of study abroad) but in an analysis in terms of public finance, the total amount of such expenditure must be included, simply making a distinction as in the case of other social services, between expenses indispensable for the operation of the school system and expenses assigned to the operation of the school system for reasons of administrative convenience.

III. Statistics required for the study of unit costs

(a) Statistics relating to the cost of education

23. It is important to take into consideration the total expenditure for education of the Ministry of Education, the other ministries, regional and municipal administrations and the contribution of the families to the expense of education. It is also desirable to try to obtain simultaneously the statistical data necessary for an analysis of costs in private education, especially if it is subsidized. It is also important to have the information necessary to classify the expenditure by subject and by nature[1] for the

---

[1] J. Hallak: Quelques remarques méthodologiques sur la confection des coûts unitaires et leurs utilisations dans la planification de l'éducation. (Methodological comment on the preparation of unit costs and their utilization in educational planning) IIEP 1966, p. 9.

the different levels of education. In order to avoid too large a number of different categories, the first two levels of this classification can be combined as follows:

- Teaching expenditure:
  - Salaries of teachers and related personnel
  - School operating costs
  - Maintenance cost of school buildings
  - School equipment
- Cost of the use of school buildings and equipment
- Administrative expense: This can be divided, if desired, into:
  - Salaries
  - Cost of the use of administrative buildings and equipment
  - Other expenses
  - Costs of related services (social expense)
  - Social services
  - Scholarships and other study and travel facilities

24. Other sub-divisions of course may also be necessary, as suggested in the following pages (according to size, location and legal status of educational institutions, teaching methods used, etc..).

25. No country has statistics available on the national scale which are exploitable in a sufficiently flexible manner to satisfy all the requirements of an analysis of this kind. It will often be necessary therefore to make use of samplings (the point at which that becomes necessary will depend on what statistics exist).

(b) Other statistics required

26. In addition to the educational cost statistics, a great deal of other data is necessary concerning the following:

- Structure of the teaching body by age, sex, seniority, qualification level and the geographical distribution;
- Teachers's salary scales, allowances and retirement provisions;
- Structure of the school enrolment by age, grade and type of instruction;
- Drop-out and course repeating rates;
- Numerous technical data relating to the school buildings, their operation and upkeep, including type, age and location of existing buildings;
- Much information on the economic and social structures, especially the structure and trend of prices and incomes, productivity in the building industry, printing, etc.;
- Data relative to the trends in economic activities and the types of training they need;
- Similar data concerning the social development, its problems and its needs (these last two types of data should facilitate an evaluation of the fitness of education);
- Data relating to the quality of education in the different educational institutions, in classes of different sizes and in those in which different teaching methods are used. Since examinations are a poor instrument of measurement, special tests should be used, but without loosing sight of the fact that results obtained in different countries or different social and cultural environments do not exclusively

reflect the value of schooling. This list is not exhaustive; it merely suggests the great diversity of data required for an analysis of educational productivity.

IV. Analysis of unit costs

27. Among the partial instrumental concepts of unit cost, we shall adopt, for the sake of convenience, the "cost per enrolment unit" concept for our analysis. The computation of unit costs in itself does not tell us much. It is only by comparison that unit costs become significant. A number of different comparisons can be envisaged:

- Between similar institutions in the same country;
- Between countries;
- In time;
- Between different teaching techniques and methods;
- Between different ways of acquiring given qualifications (formal schooling, apprenticeship, in-service training);
- And perhaps between actual costs and a standard.

28. We shall proceed with our analysis of unit costs in two stages. For the first stage we suggest taking up the various cost components separately and individually, which should make it possible to find explanatory factors for every difference observed. In the second stage we shall endeavour to group these explanatory factors in homogeneous categories and go further in our analysis by examining the cost components not only separately but in combination.

1. Factors tending to explain differences observed in various components of the unit cost

(a) Teacher cost

29. Differences noted in the cost per pupil of different teachers may be attributed to :

A difference in the average number of pupils per teacher, reflecting:

The average number of pupils per class;

The ratio between the number of hours per week of pupils and teachers;

The percentage of teacher substitution;

A difference in the level of remuneration of the teachers, reflecting:

A difference in salary scales;

A difference in the structure by age, sex and degree of qualification of the teachers;

A difference in fringe benefits granted to the teachers :

Indemnities and allowances, housing, provisions for retirement.

A difference, sometimes, in the geographical structure of the school system, salaries and other items not being the same in the towns and in rural areas.

(b) The cost of teaching materials

30. Differences noted may be attributed to :

- the quantity of books and other materials per pupil;
- kind of material used;
- quality of material;
- life-time of material, if applicable;
- prices of school equipment.

The price of school equipment depends on the economic conditions of the country, the organization of production and distribution, the possibility of local production and the volume of such production (especially in the case of books), and on the import need.

(c) Cost of operating school buildings

31. This concerns essentially water, heating and lighting. It is noted that these costs tend to be higher in modern school buildings which have a greater degree of comfort. They also depend on certain local price levels.

(d) Cost of upkeep of the buildings

32. This cost depends on the type of building. The better built buildings require less maintenance, but the more sophisticated types of buildings require more than the others. It also depends on the technical and economic environment and on wage levels in the occupations concerned (the disappearance of cheap labour tends to raise this cost appreciably at a certain point in the development of the country, unless rationalized maintenance methods are applied).

(e) Administrative costs

33. The different items of administrative expenditure should be analysed in order to track down any differences which are noted and in particular to point out the difference between salaries (to which most of the considerations already expressed in the case of the teachers are applicable) and other factors, of which administrative methods and domestic price levels are undoubtedly the most important.

(f) Cost of related services (or social expense)

34. The differences noted are particularly large in this category. They reflect first of all the development of the social policy of the Government

on behalf of school pupils and students, but also the effect of other factors, such as:

- Density of population;
- The need to make up at school for under-nourishment of the children;
- The need to attract young people into certain types of instruction;
- Or else to enable them to find other countries possibilities for study which their own country cannot offer them.

The nature, quantity and cost of such services are the chief explanatory factors to be considered.

(g) Cost of the use of buildings and equipment

35. The differences observed in this connexion can be attributed to differences in:

- The cost of acquisition of the land (including related charges);
- Cost of design and construction of buildings;
- Period of time the building is used;
- Interest rate applicable;
- Extent of utilization.

2. From differences in cost to differences in productivity

36. Having identified the differences observed in the cost per pupil and the factors immediately involved in these differences, thus enabling us to isolate that portion of the differences which is significant from the point of view of productivity, we must then eliminate the effects of two kinds of factors:

- the effect of the social and economic context;
- the portion of the cost which can be attributed to non-educational purposes, such as making educational activities comfortable and the provision of social services accompanying the educational process.

37. It is true that these various factors de not always exercise their effects in the same direction. The school system having the highest cost per pupil may actually be the one which provides the lowest degree of social facilities and of comfort. Taking these factors into account may therefore increase the significant deviation from the standpoint of productivity.

38. The social and economic context has a strong effect on the unit cost of education:

- Especially price levels (or price trends for comparisons in time) and the price structure (or its trend) determined by the economic conditions of the country (even when working at parity exchange or in constant "francs" since these are determined by prices as a whole and not exclusively by those which are of interest to us).
- Salary levels, even more than price levels, are of basic importance, because a large fraction of the cost of education consists of salaries. Differences in rates of remuneration of teachers and administrators reflect not so much the value of their respective contribution, as a necessary balancing of rates of remuneration within the national economy. These salaries therefore fluctuate in proportion to the general level of incomes, whatever may be the trend of productivity in the educational sector. Moreover, the ratio between teacher income and the average national income reflects the position occupied by the teachers in the social and professional structure - a position which is privileged in countries where education is least developed but tends to approach the average in step with the increase of the intellectual élite and of higher-level activities in other branches.

Only the differences in teachers' salaries which correspond to differences in their qualification ratings should not be eliminated under the heading of differences in the social and economic context. The differences in qualification rating are based on the respective educational background and academic titles of the teachers, and - more questionably - on salary distinctions due to seniority or to sex.

- The productivity of sectors which produce certain inputs necessary for education can also be classified as being under the influence of the socio-economic context. For example, the cost of the use of school buildings depends to a considerable extent on productivity in the building trades. Perhaps a distinction should be made between the part played by the design of a building and the awarding of the contract (which are responsibilities of the education sector) and that of the execution of the works, which alone depends on the productivity of the building sector. Likewise, the productivity of the book printing and furniture industries affect the per-pupil cost.

39. Comfortable school conditions may partly serve an educational purpose. Actually, they are determined in the first place by the standard of living of the population; the degree of comfort of the schools should not be lower than that of the living conditions to which the children are accustomed. Should increased comfort in the schools be considered as being conducive to less productive educational activities or as an argument that resources devoted to education should also serve for other purposes?

40. Social services accompanying education are in some cases essential for the operation of the educational activities and in other cases they are provided only for reasons of administrative convenience. It is therefore necessary to analyse social services provided by the schools according to their

purpose - an analysis which is made more difficult by the twofold purpose of many such services, which are undoubtedly indispensable for the operation of the educational activities but at the same time are important elements of a policy of health, etc.

41. Some rather serious difficulties arise from the elimination of the effect of the social and economic context and of non-educational objectives:

(a) There are strong possibilities of substituting one input for another, for example:

- Construction cost of a building - upkeep cost;
- Teacher salaries - purchases of equipment and supplies;
- Introduction of new specializations in higher education - scholarships for study abroad;
- Teaching cost - cost of school buses;
- Cost of repeating courses - cost of upgrading the teacher's qualifications; etc.,

and over a longer period of time:

- Teaching cost - cost of pedagogical research;
- Teaching cost - cost of educational planning, etc.

For a comparative assessment of the productivity of educational activities, it is therefore not sufficient to count only the strictly educational expenditure, but it is also necessary to take account of the other expenses, particularly those occasioned by social services, in spite of the complex purposes for which they serve. It is possible, as a matter of fact, to show substantial savings in the expense of education by increasing certain items of expenditure classified as social. Similarly, it is not possible to analyse administrative and teaching cost separately in order to determine their respective production to the extent of the capacity for substitution between two cost components.

42. (b) It is not possible to refer to the existing structure of input utilizations in order to eliminate the effect of the social and economic context. The effect of this context does not provide a valid explanation of a difference in unit cost unless an optimum combination of inputs, with due consideration of their respective prices, has been applied in an educational system.

43. Once we have removed the effect of the social and economic context and that of the pursuit of non-educational targets, what do we have left? To what does the difference observed in the unit cost correspond? It corresponds to a difference in educational effort per pupil or student, and this difference itself may perhaps be broken down by analysis into a difference of output per pupil or student (quantity and utility of knowledge acquired) and a difference of productivity (utilization and more or less efficient combination of the different inputs).

V. The use of unit cost comparisons for the analysis of productivity

44. In the preceding paragraphs, taking the enrolment unit as the educational unit, we reached the stage of "educational effort" comparisons per pupil. In order to arrive at an analysis of productivity itself, we must take into consideration the quality and the fitness of education. Unfortunately, it is not possible to define with sufficient accuracy an educational unit which will include quality and fitness, and we are therefore forced to study the per-pupil cost, quality of education and fitness of education separately. That obviously involves sensitive problems of evaluation owing to the difficulty of establishing a standard scale of differences in quality (and still more so of differences in fitness) which can be compared with the differences in cost. It is not sufficient in fact, to express these differences in figures, the scale must be established in such a way that a change from index 50 to index 60 for example, could be correctly interpreted as an actual improvement of 10%.

45. In the following paragraphs, we suggest a few possibilities for comparisons between the cost per pupil (or more precisely the "educational effort" per pupil) and the quality of education (and where possible the fitness of education).

1. Comparisons between different methods of training within a country

46. Comparisons made within a country at a given moment offer the advantage of a certain degree of uniformity in the socio-economic context. They therefore make it easier to isolate the effects of differences of productivity of the educational system. It is also true that they offer the disadvantage of not allowing a comparison of very different systems, unless pilot experiments are resorted to.

The cost of the central administration cannot be included in the analysis for lack of terms of comparison.

(a) A number of studies have already been made on the effect of the size of the school. The size of the school affects the per-pupil cost in a number of different ways:

- Cost of construction per pupil space;
- Degree of utilization of classrooms;
- Degree of utilization of specialized equipment;
- Upkeep costs;
- Administration and inspection costs;

- Variations from the optimum classroom size[1];
- Cost of related (social) services provided for the pupils;
- etc.

It would be useful to ascertain whether the size of the school also has an effect on the quality of the instruction. By comparing the unit cost in proportion to the size of the school with the population density, it is possible to determine whether or not it would be better to operate a large school-bus service to pick up the pupils rather than to create smaller school units.

47. (b) Similar studies could be undertaken on the cost per pupil and the quality of education in proportion to classroom size. Technically, it would be a matter of comparing the downward curves of cost and of quality, which would make it possible to compute the optimum size from the point of view of maximum productivity from the curve of the quotient $\frac{\text{quality}}{\text{unit cost}}$[2]. This problem must of course be reinserted into the larger setting of the complete school course: the minimum quality required for promotion, etc.

1/ The Central Bureau of Statistics of the Netherlands made an interesting statistical study (cf. Fr. Edding: Methods of Analysing Educational Outlay. Unesco 1966 pp. 25-26). It shows (Diagram 2) that in the secondary schools the classroom size is much below normal when the number of students is less than 200, approaches the normal size at an enrolment of 500 and reaches it at 800. The unit cost curve follows rather closely the classroom size curve (Inversely of course).

2/ See numerial example of Annex.

48. (c) In spite of the differences in soci-economic context, which affect both the per-pupil cost and the quality of education, it may be worthwhile to make a comparison between urban schools and rural schools. The differences found must of course be interpreted with care in order to isolate the factors proper to educational productivity. That study may reveal opportunities for improvement in the organization of the educational system.

49. (d) The difference in unit costs between public and private institutions may also disclose opportunities for improvements of a pedagogical or administrative character. That unit cost difference must, however, be carefully analysed, because of very different operating conditions (unpaid religious personnel, cost-free general administration and inspection, etc.). The inquiry should also include quality.

50. (e) Comparisons reveal that an important factor of difference is the level of qualification and of seniority of the teachers (often accompanied by large differences in remuneration). It may be of value to compare cost differences and quality differences to serve in guiding the policy of selection and promotion of teachers.

51. (f) Instruction by different methods, use of audio-visual aids, programmed teaching, etc.

Comparisons of cost and quality are generally made difficult by the fact that one, at least, of the alternative modes being compared may be a pilot experiment which does not enjoy the reduced cost which it would derive from being used on a large scale. Moreover, the quality of the result may be more difficult to compare because the change of teaching method is frequently accompanied by a change in educational philosophy (or, to put it more concretely, a change in the type of training of the mind and of the personality which is sought for).

52. (g) Alternative systems of vocational training.

We have scarcely given any thought in the preceding paragraphs to the fitness aspect of education, although it could well have merited some consideration in Section V. In vocational education, fitness is the outstanding target - which makes the analysis all the more difficult. It is true that just as tests of the level of education acquired are given in order to assess quality of instruction, fitness can be evaluated by the ability to perform certain tasks. This evaluation is easier in countries and in branches of activity which have something of an industrial tradition than in new countries or new activities. In all events, it may often be necessary to resort to the opinion - possibly coloured by traditional attitudes or prejudice - of businessmen.

Another fact is that we have defined the cost concept for formal education, while other types of trends present new problems of attributing costs - problems which it may be impossible to solve when training is tied in with production.

53. (h) Comparisons between different types of education

The great differences existing in unit costs in various types and at various levels of education have been stressed in many different studies. It is also true that these differences imply differences in productivity, besides other differences. But the other factors are too important to be easily utilized in an analysis of production. They should nevertheless be taken into consideration in at least one respect. Different types of education sometimes lead, from the practical standpoint, to the same result. This is notably the case with the technical high school, which attracts boys who did not make the grade in classic or scientific studies but who hope to reach the university level by this detour or else to go into the administrative, rather than the technical, types of professions. This brings up the point as to how much more expensive technical education is than general education, and it is one of the typical cases in which lack of fitness decreases the productivity of the educational system.

54. (i) Comparisons in time.

Important studies have been devoted to the analysis of the cost per pupil trend. We refer in particular to Fr. Edding's Methods of Analysing Educational Outlay (Unesco 1966 pp. 35-55) and the studies which he quotes in reference. To what extent do these studies enable us to evaluate the trend of educational productivity?

To the extent that:

- They remove the effects of price trends. (By means of adequate indices for each type of input, when possible);
- They take into account other changes in the socio-economic context;
- They take into consideration the trends in educational conditions (town-dwelling percentage of the population, increasing social acceptancy of co-education, etc.)
- They take into account the development of related (social) services rendered to school pupils.

To the extent that they do the above things, these studies enable us to determine what part should be attributed to the development of educational productivity in the development of the unit cost. There remains to be evaluated the trend of quality and fitness of education - an evaluation which is made more difficult in some cases by the changing social environment of the pupils and students, their living conditions and their state of health.

2. International comparisons

55. International comparisons are in a sense the most instructive, because they enable very different systems of education to be weighed one against another. They are also the comparisons which pose the most difficult problems of interpretation. As a matter of fact:

- The removal of that part of the observable differences due to social and economic context is difficult and requires a keen sense of evaluation, because the boundary line between the effect of the environment and the characteristics of the educational system is not always clear.
- Owing to the difference in culture, language and educational philosophy between two countries, the comparison of fitness poses problems of concept as well as of method, because the educational purpose is quite different.
- The difference between educational systems poses problems of statistical definition and of interpreting the differences found. Acutally, owing to the substitutability of certain inputs for others, only the difference bearing upon the overall unit costs is significant as regards a difference in productivity. The factors involved in that difference are numerous and it does not seem technically possible to isolate them.

3. Comparisons with a standard

56. There can be no question of establishing a fixed optimum standard for the unit cost and the quality of education? And yet, as a step between the lessons derived from the preceding analyses and their application to the various educational institutions of the country concerned, it may be helpful

to summarize a certain number of conclusions in the form of a basic chart of unit costs, with variants to allow for the variety of educational conditions. The idea would be, in a general way, to define a normally functioning school (adequate buildings, teachers having the desired level of training, optimum size of classes, enrolment loss rate considered standard, etc.) and to make an analytical comparison of the costs of existing institutions with that standard. Certains factors would be brought out to good advantage in this way, including the following:

- The consequences of population migrations on the costs of education[1];
- The effects of under-utilization of existing equipment;
- And, if the cost per graduate is compared, the often heavy consequences or drop-outs will appear[2]

VI. Conclusions

57. The preceding pages merely suggest a few guidelines for research, in order to define more accurately the concepts of educational productivity and of unit cost and to measure and analyse the productivity of the education sector after removal of the interferences of the social and economic context on unit costs. In order to draw conclusions it would have been necessary to have attempted the application of the proposed concept and methods on a large scale. We have not been able to do that. Therefore, by way of conclusion, we will confine ourselves to raising the question as to what the results of this kind of analysis could well be.

58. When we compare the unit costs of a few different countries, the discrepancies are enormous. It is of course possible to explain a wide variation

---

[1] Cf. Fr. Edding, op. cit. p. 15

[2] Cf. Isabelle Dublé: Les Rendements scolaires en Afrique (School Outputs in Africa) and Jacques Proust: Les Déperditions scolaires au Gabon, dans le Tiers-Monde. Problèmes de la planification de l'éducation (School drop-outs in Gab in "Tiers-Monde". Problems in Educational Planning), 1964.

in such and such a cost component by attributing it to differences in quantity, quality or price of the input concerned, but such comparisons give us no information on educational productivity. By removing the effects of the socio-economic context and of differences in the amount of related or social services provided in connexion with the schooling and in the degree of comfort of the school conditions (to the extent to which the end purpose of these factors is not educational), we can bring out the differences in the cost per pupil which are significant from the standpoint of productivity. These differences will probably be much smaller than those which appear in a simple comparison of unit costs. They will probably not always be in the same direction, because the countries where the per-pupil cost is the highest are also those where the productivity of economic activities as a whole is the highest and perhaps also the productivity of the educational activities. On the other hand, low per-pupil costs sometimes mask a poor organization and faulty administration of education - offset, it is true, from the standpoint of cost by the large size of the classes, poor equipment, etc.

59. Thus, if we compare between countries the per-pupil cost of a given type and level of education (with all interference eliminated), it would be difficult to predict the order in which the countries would finally stand. If the per-pupil cost (with all interference eliminated) does not show a significant trend in the comparisons between countries, or in comparisons based on temporary data relating to one country, what is the meaning of an educational cost analysis in so far as an improvement in productivity is concerned? Is there or is there not a real possibility of improvement?

There are, to be sure, possibilities of decreasing the cost of education per pupil or student:

- by improving the educational system and its administration by technical innovations;
- or by decreasing the gap between the actual operation of the existing system and what it ought to be, by eliminating waste and administrative deficiencies.

60. To what extent will it be possible to reduce the cost per pupil? It is difficult for us to evaluate that possibility, but we are not highly optimistic on that score - not that we doubt the possibility of increasing the productivity of the education sector, but because we believe an increase will be not so much in the form of a decrease in the per-pupil cost (with all interferences eliminated) as in the form of an increase in the result of the "educational effort". That increase in the result of the "education effort" is; moreover, linked to increases in per-pupil costs and to additional efforts in the fields of pedagogical research (which should improve the quality of the teaching) and of planning (which should improve not so much the quality as the fitness of education).

61. It could therefore be dangerous to concentrate one's effort towards decreasing the per-pupil cost. By doing so, more than one country has compromised the productivity of its education:

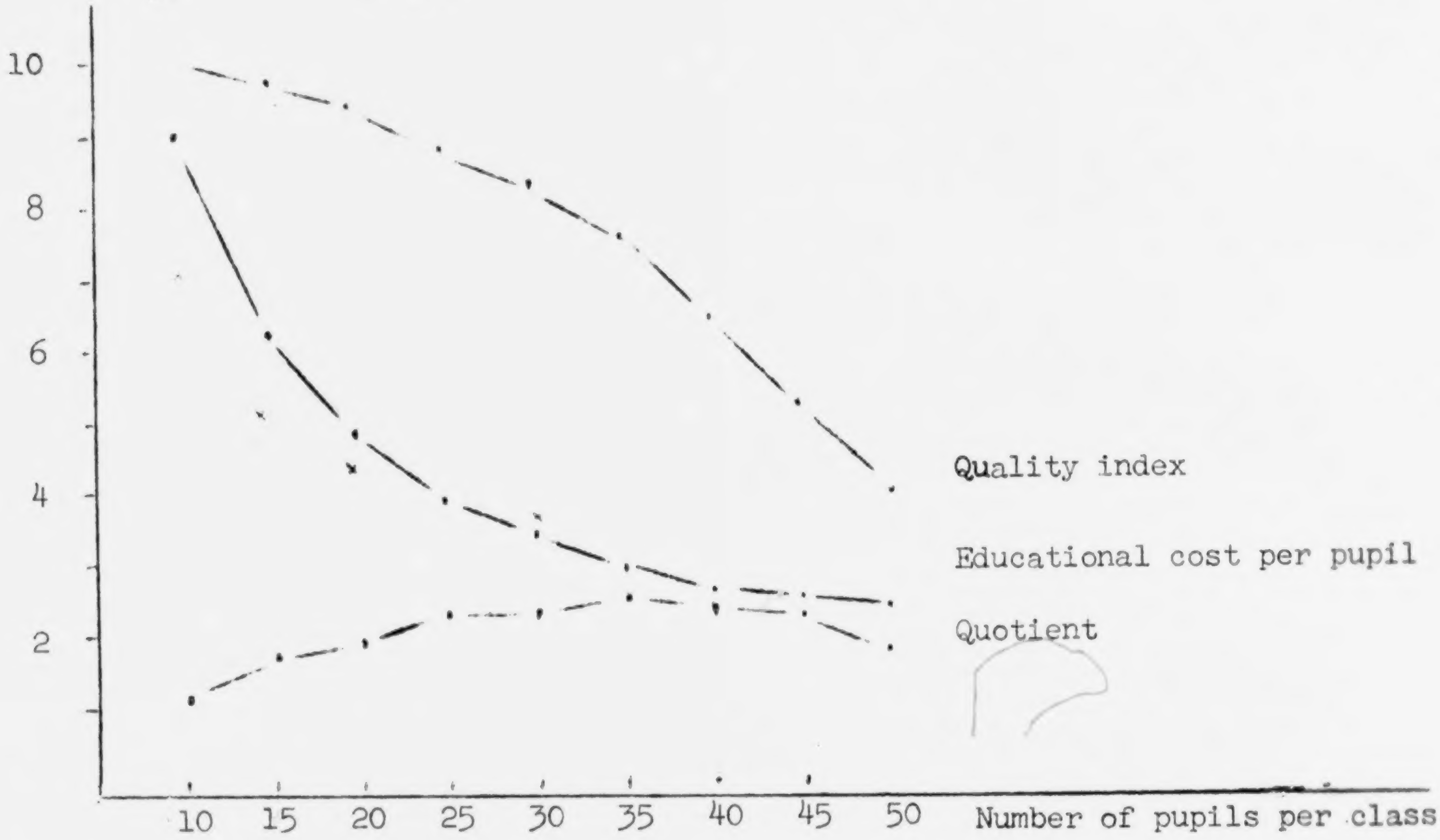
- by neglecting pedagogical research;
- by favouring cheap instruction instead of the instruction necessary for the development of the country;
- by compromising educational quality by overloading the classes;
- by driving the most capable young people away from the teaching profession because of the low salary scales, etc.

62. The research effort for productivity should therefore be brought to bear on attempting to achieve cost-quality-fitness equilibrium. Maximum productivity can only be sought for in a logically balanced combination of economic, pedagogical, cultural and other aspects. Partial research efforts are useful and can supplement one another, but they may be conducive to error and they do not make it possible to determine the optimum. Comparisons between countries can be instructive, but they are made difficult by the great differences existing between educational operating conditions. On the contrary, intense analyses effected within a given country, accompanied by pilot experiments and pursued in conjunction with pedagogical research and the study of the social needs of education (development of economic, social and cultural activities) should bring to light wide possibilities for the improvement of educational productivity.

Annex

Numerical example illustrating paragraph 47[1/]

Number of pupils per class	Total Educational Cost	Educational Cost per pupil	Quality Index	Quotient of $\frac{\text{quality}}{\text{unit cost}}$
10	900	90	100	1.1
15	925	62	97	1.6
20	950	48	93	1.9
25	975	39	88	2.3
30	1 000	33	83	2.3
35	1 025	29	75	2.6
40	1 050	26	64	2.5
45	1 075	24	52	2.2
50	1 100	22	40	1.8



[1/] For lack of statistical data, the above figures were invented to illustrate the method.

PROBLEMS OF MEASURING EDUCATIONAL YIELD IN ORDER TO ASSESS EDUCATIONAL PRODUCTIVITY

by N. Bodart

CONTENTS

Page

A. The concept of educational yield V - 1

B. Problems of the numerical measurement of output V - 5

C. The problems of the "subjective" measurement of output V - 10

D. Problems of the "objective" measurement of output V - 12

A. THE CONCEPT OF EDUCATIONAL YIELD

1. When writing this paper, the author had not yet seen the working document on productivity concepts applied to education, prepared by IIEP for the present seminar.

Knowing the deviations and abusive meanings given to this term, one hesitates in choosing measurement indicators of educational yield to be used in calculating productivity.

2. It has nevertheless been assumed that the following distinctions may be made between what may be called:

i. The productivity of production factors in education

(a) Aggregate productivity of factors $= \frac{\text{Output}}{\text{Input}}$

output consisting in the educational production, and input the aggregate cost of production factors (labour, capital + depreciation)

(b) Marginal productivity $= \frac{\text{Output}}{\text{1 production factor}}$ (educational production)

the output may be related to labour(on an hour or manpower basis) or to capital (cost).

This productivity of production factors can itself be accounted for by units of output measurement. We thus have:

(c) The physical productivity of education (in real terms)

$\frac{\text{Output}}{\text{Input}}$ (expressed in units or trained products)

(d) The productivity in value terms

$\frac{\text{Output}}{\text{Input}}$ (expressed in monetary terms)

ii. The productivity of an education cycle considered as a production factor; the cycle being the educational span of time necessary to produce a certain number of finished products.

In this case, we have:

$$\text{Productivity of a cycle} = \frac{D + A}{D}$$ [1]

D = number of years spent in school by pupils completing the cycle,

A = number of years spent in school by those who drop out or repeat.

iii. In a wider sense, the productivity of the education can be seen as the impact of education on its social-economic environment. For example:

Productivity of education as a production factor:

$$\frac{\text{Output (national production)}}{\text{Educational costs}}$$

or, in terms of factor productivity, considering the educational output as production factors

$$\frac{\text{Output (national production)}}{\text{Educational production}}$$

In this case, the educational output would be the denominator of the fraction expressing productivity.

A major difficulty in these formulae is in dealing with the gap between the time production takes and the educational time necessary to train the manpower employed on that production. In other words, how in practice can we calculate the costs of education which takes between 15 and 20 years in relation to the annual national production ?

---

[1] Cf. Debeauvais, "The economics of education, p.539.

Here, productivity (which is the quotient of production divided by one or a total of production factor necessary to that production) must not be confused with the proportion the annual expenditure on education bears to the gross domestic product or to the national budget - which is obviously much easier to compute.

3. Whatever will eventually result from these attempts at definition, it is intended to consider "educational yields" in a broad sense; this will justify raising measurement problems which go beyond the narrow question of calculating enrolments, and will enable us to deal with most of the requirements arising from a close examination of the various concepts of productivity applied to education.

4. It will be well however, before considering yield measurement to define the idea and concept properly and examine its relations with the notion of productivity.

Productivity is calculated by determination of the quotient of production divided by one or a total of production factors it involves. In education unfortunately, the English term "output" is not always rendered in French by "production" or "extrants" (leavers) or "sortants" (graduates) but by "rendements scolaires" (educational yield). In French, yield and other ideas - like productivity of labour - are often used for one another and are in fact very close.

Strictly speaking, yield is the relation between the result obtained and the means employed to produce it, expressed in the same unit (e.g. the yield of an electric motor is 90% means that 90% of the energy supplied in the form of electricity is given back in the form of motor power). But by extension, the term yield is used when the same unit is not used above and below the dividing line and, accordingly, the term is used for individual productivity of labour and, in agriculture, the result obtained per unit of surface or unit of time (e.g. a yield of x bushels of wheat per acre).

There is further confusion between yield ("rendement") and return ("rentabilité"), the latter being closely linked with the idea of profit and its rate expressing the total profit obtained on the total expenditure involved. There is also the social yield potential ("rentabilité sociale") that take in the idea of the progress of the whole community. Returns ("rentabilité") is a marginal concept. In the firm, it measures the margin between the profit obtained from the sale of a product and the effort that goes into its production $\left(\frac{\text{Profit}}{\text{Capital}}\right)$.

This idea is very close to the idea of profit margin $\left(\frac{\text{Profit}}{\text{Turnover}}\right)$, whereas the trend of productivity expresses production trends in terms of factor yield after the quantitative variations in each have been eliminated.

5. It hence appears that the title of the present paper is unsatisfactory and should evoke the measurement of the educational production as a factor of educational productivity and not only the measurement of educational "yield".

The Educational production should therefore be examined under different aspects:

- the output: graduates, non-graduates, drop-outs;
- the yield of an education cycle i.e. the relation between the production and enrolments of a cycle, and other ratios evidencing the progress of a class through the cycle;
- the social yield potential of this production i.e. the extent of its adjustment to development needs.

6. The forgegoing leads us to consider, successively, the problems of:

- the "numerical" measurement of output i.e. as furnished by the school in given numbers of product units (graduates, repeaters, drop-outs) in absolute figures or in terms of output by cycle;
- the "subjective" measurement of output i.e. taking account of the aptitudes of the product (the trained student) with regard to internal valuation standards of the educational system concerned;

- the "objective" measurement of output i.e. showing the relationship between the product and its use in the social-economic context of the nation.

7. We deliberately discard the correlated notions often considered to be antagonistic, viz the quantitative and qualitative measurement of output, since the "quality" of production is precisely the aspect which raises the most difficult quantitative assessment problems and it is here that research is needed.[1] Economists computing industrial productivity have the same problems since production statistics rarely take account of variations in quality. In gas production for example, the problem has been solved by referring to a standard quality of gas having a specific heating capacity.

B. PROBLEMS OF THE NUMERICAL MEASUREMENT OF OUTPUT

We shall distinguish the indicators of production and yield:

1. Production indicators of a cycle used to distinguish between all leavers:[2]

  - pupils who complete the educational cycle and graduate,
  - pupils who complete the cycle but do not graduate,
  - pupils who drop out.

Several measurement problems arise here:

(a) First, that of determining the cycle which leads to a diploma. The educational process implies a certain length of exposure to teaching techniques leading to a diploma, or covering a specific training period.

---

[1] Cf. J. Bousquet - Notes sur les concepts de quantité et qualité en éducation.

[2] For the statistical calculation of indicators and production and yield rates cf. C. Vaugrante, Course C.3, 1966 Session at Dakar, Dakar Regional Educational Planning and Administration Group, Unesco.

In primary education, the cycle varies by country between four and seven years, and present plans in Africa to ruralize primary education will involve still further variations.

It is thus essential to refer to the national context in order to find out for each country the cycle corresponding to what is considered as the duration of primary education.

The teaching divisions in French-speaking Africa (C1 - S1 or CP - CE - CM) could give rise to calculations of production on "cycles" which in fact are only rather arbitrary administrative divisions.

Much more important would be the determination of what might be called the "elementary literacy cycle", below which the pupil leaving school would lapse back into illiteracy.

The determination of the cycle in the secondary short and long courses, and in technical education, is much more delicate.

The cycle could be defined as the duration of exposure to teaching techniques considered in a given country as necessary and adequate to get through an essential stage of education for an activity defined in relation to the country's social-economic context.

It will be seen at once that there can be no question of establishing international norms for the duration of cycles and that, accordingly, all international comparisons need corrections or adjustments to be significant.

(b) Drop-outs cannot be calculated, as in the case of graduates at the end of a cycle, simply by counting, and are usually not dealt with in current statistical tables.

The number of drop-outs A in a class i is equal to the difference between the numbers enrolled E_i in this class into and the total qualifying from it enrolled in the class next above:

$P\ (i + 1)$ in t_1 and repeaters in the same class $R_i\ t_1$, hence

$A\ (i, (to/t_1 = E\ (i, to) - [P\ (1 + 1\ t_1) + R\ (i, t_1)]$

To calculate drop-out for a full cycle of classes for a given school year, the following formula has the advantage of operating by counting new enrolments and total enrolment and eliminating the calculation of repeaters:

$A\ (1.6, to) = E(1.6, to) - E(1.6, t_1) + P(1, t_1)$ 1/

where $A\ (1.6, to)$ = Drop-outs for a six-year cycle at the end of year to

$E\ (1.6, to)$ = Enrolment for a six-year cycle at the end of year to

$E\ (1.6, t_1)$ = Enrolment for a six-year cycle at the end of year t_1

$P\ (1, t_1)$ = New enrolments in the first year of the cycle in year t_1

Example: Drop-outs for the whole six-year primary cycle in Dahomey during the year 1962-1963

$A\ (1.6/to)$ = Primary enrolment 1962/63 - Primary enrolment 1963/64 + new enrolments in first year of 1963/64 class = 73,990 - 79,974 + 17,033 = 11,049

(c) It may happen that graduates do not quit the cycle buy repeat in order to better qualify for a competitive entrance examination to a higher institution. This happens to many who get the primary school certificate in Africa but for whom places are not available in the sixth class. Account must be taken of this in establishing the real number of graduates who leave.

1/ See C. Vaugrante op.cit. for a demonstration of this formula.

(d) Current educational statistics usually do not indicate pupils who leave without passing the certificate, most annual tables merely mentioning the number of certificates obtained at the end of each cycle. Here also, the statistics need refining.

Thus, it is not easy to obtain an exact picture of the production of a cycle among which the following can be distinguished in absolute figures:

- finished products (graduates)
- "by-products" (leaving without certificate)
- losses (dropping out during the cycle)
- waste (dropping out before completing an elementary literacy cycle)

Nevertheless, all of these are necessary to determine physical units of educational "output". The problems here concern the collection of current statistical data. The educational economist concerned with computing productivity must instruct educational statisticians to provide data which seem most useful to him and to refine gathering techniques.

2. Indicators of the output of a cycle

It is perhaps because the calculation of the indicators of production involves so many difficulties that educational statisticians have concentrated on yield; in fact this field is covered by a vast literature and has a sophisticated methodology.[1]

It is also perhaps because various output rates are the essential tools in making enrolment projections which are themselves indispensable to the planner.

---

[1] For the methodology, one need only refer, among others, to Volume 1 of the IEDES study: "Les rendements de l'enseignement du premier degré en Afrique francophone - Présentation méthologique" (1967); "Essai d'analyse des mouvements d'effectifs dans l'enseignement du premier degré au Gabon"by Jacques Proust (1964); and to Madame Vaugrante's course at the Unesco Regional Educational Planning and Administration Group, Dakar.

The output rate formulae measure the production of a cycle i.e. the relation between input and output of the educational system, and its production flow:

- enrolments are compared from one year to the next (rate of increase);
- numbers in the final year of the cycle are compared with numbers in the first year (apparent output rate);
- up-gradings (promotions) are compared with those of the previous year (promotion rates);
- the number of promotions and repeaters in a class are compared with the total numbers of the previous year (retention rates). The retention rate is thus equal to the aggregate promotion and repetition rates.

This last formula is particularly interesting, since it allows an analysis of the progress of a specific class, which serves as a basis for enrolment projections.
It leads on to the notion of real output and allows the calculation of an average number of years of schooling completed by a pupil in the terminal class, and the computation of the number of pupil-years necessary to obtain a given number of students in the terminal class for the theoretical duration of the cycle.

The retention rate thus makes it possible to measure the real output (number of units really trained and graduated per unit of educational time).

To analyse the progress of a specific class, the numbers in the lowest form are compared with the enrolments of the following forms during consecutive years.

This gives, for example, the survival rate per thousand pupils enrolled in the first year who are followed through all the consecutive years of the cycle. The main problem in calculating the "real output or yield" is in exactly counting the repeaters at each stage to which the original class passes.

Present statistics are usually full of errors for reasons that are easy to understand:

- because of the complexity of situations, the calculation of repeating lends itself to confusion at the counting stage by teachers and inspectors;
- many repeaters in Africa change schools and are then considered as "new enrolments";
- teachers are usually ashamed to declare too high a number of repeaters and tend to hide from the authorities the rate of repeating which, rightly or wrongly, they consider fatal to their reputation as teachers;
- When survey sheets are distributed to pupils in order to trace their school careers, many, consciously or not, omit to mention the repeat years.

The problems at this level are psychological and statistical. A better statistical training for primary inspectors would be a first stage towards obtaining trustworthy data on real output.

The solution is known and simple in theory - the establishment of individualized data [1], i.e. an individual index card by which the school career of each pupil could be traced. The practical problems involved have not yet been tackled in the African countries.

C. THE PROBLEMS OF THE "SUBJECTIVE" MEASUREMENT OF OUTPUT

We are concerned here with measuring aptitudes of the product (the trained student) in relation to the intrinsic internal appraised standards of the system. This involves assaying and tests of level which suppose that the level of knowledge and aptitude a pupil should possess at the end of the cycle is known, the level being determined by a syllabus whose content and graduation are defined by law.

---

[1] Cf. OECD: Handbook of statistical needs for educational investment planning, 1966, page 93.

This is a sector that some African countries are beginning to explore. The study of the level of knowledge can be made by analysing promotion examinations, by tests of level, by subject and year of study, and by longitudinal tests (a single examination for all classes in the same cycle).[1/] The questions regarding the measurement of output to be put to experts in assaying and the psychotechnicians are of three orders:

(a) have the pupils leaving school reached the level required by the national regulations?

(b) If not, what level have they reached in relation to this optimum or to other examinations whose level is well known?

(c) In relation to those graduating, what level has been reached by pupils who drop out during the cycle?

Serious assay studies in Mali, for example, on the comparison of results of the French and Mali baccalauréats, or marks obtained in orthography and composition in the ninth fundamental classes show that countries that have instituded a fairly radical reform of their educational systems are obliged to situate the level of those leaving school.

In theory, the quantification of the level is provided by the marks obtained in examinations and can be expressed by the averages obtained by a pupil, a group of pupils, or in a subject or group of subjects in the syllabus, i.e. what we shall call the subject of measurement of the apparent levels of output. It is another problem to know how far these marks can be trusted, and only after a thorough assaying investigation would it be possible to obtain what we shall call a subjective measure of the real levels of output.

It is a fact that an analysis of averages (homogeneous or heterogeneous), of dispersion indices measured by the standard deviation and the analysis

---

[1/] Cf. J. Berbaum, Unesco expert, ENS Abidjan: "Monographie d'une école primaire - Etude du niveau de connaissance des élèves d'une école primaire des faubourgs d'Abidjan", 1966.

of variations between schools, for example, may reveal grave anomalies caused by the methods of marking.

The pupil's ability to reach the average may depend on purely assay factors such as the official weighting coefficient for subjects, the dispersion of marking in each subject, the scale of marking used according to examination, and the criteria for written, oral, and class-work marking. The subjective measurement of output must therefore undergo a necessary critical examination of the tools it employs.

Sampling is necessary in each country to establish, for example:

- a comparison of the scales of marking of different teachers for an exercise given to the same pupils;
- a comparison of the scales of marking of a given teacher of the difficulties in exercises given to the same pupils;
- a comparison of the scales of marking of the same professor on an exercise given to different groups of pupils, etc.

In this way standards could be laid down and proposed for marking purposes and then submitted to the responsible authorities for implementation. It is only at this price that measurements of educational output expressed in marks obtained according to internal appraisal standards will be significant in handling educational productivity formulae.

D. PROBLEMS OF THE "OBJECTIVE" MEASUREMENT OF OUTPUT

Knowing how to quantify output and measure its level in relation to internal criteria of the educational system is not enough to provide a satisfactory picture of the educational production and yield.

The value of these output data must also be measured in relation to their ultimate purpose, i.e. the actual use of the school leavers by their society. It is what we call the "objective" measurement of output which obliges us to distinguish between categories of output, whether or not they lead to employment.

The method is to group the leavers (drop-outs, graduates, non-graduates completing the cycle) according to level of qualification acquired at the end of their studies.

This level can be conceived only in relation to the specific needs that derive from the country's state of development. It is thus impossible to establish international norms; at most, there might be a typology of countries by level of development.

The measurement of output might for example be conceived at the following levels:

- End products: pupils (graduate or not) leaving with the certainty of finding a job, their qualifications satisfying the requirements of economic demand in their category;
- Semi-finished products: pupils (graduate or not) leaving school whose employment depends on supplementary out-of school training;
- By-products: pupils (graduate or not) leaving school whose qualifications do not satisfy demand requirements in their category but sufficiently qualified to adapt themselves to a residuary sector, e.g. boys leaving the ordinary primary school who, without any special training, must work in agriculture; or numerous pupils with the primary certificate who fill minor administrative posts in Africa;
- Waste: pupils leaving school who become illiterate again; pupils who cannot find a job after leaving school or cannot adapt themselves to the needs of occupational mobility, etc.

For example:

- In this classification, the pupil leaving before the fifth year of primary school and thus destined to relapse into illiteracy will be a waste product as the educational process has taken no hold on him and he has been rejected from the process before his transformation.

- In some African countries, pupils leaving after 5, 6 or 7 years can train on the job as specialized workers. These are thus semi-finished products.[1]
- In other countries, such students will be by-products, having no possibility of obtaining a qualification outside school, but they might adapt themselves to certain activities (e.g. rural) for which they had no specific training, etc.

The "objective" measurement of outputs should be based on the results of manpower surveys, in order to determine the demand for trained manpower, and the possibilities in each country of training semi-finished products on the job; on an analysis of the capacity to absorb by-products of residuary employment sectors such as agriculture; on the degree of motivation and capacity for occupational mobility of the outputs.

All these requirements mean that objective measurement is not usually considered in calculating the yield of educational systems but they are vital factors if one wishes to avoid judging educational productivity divorced from the context of economic and social development.

One may well ask the question, at the end of this analysis, whether the measurement of output is of real use to the educational planner.

1. Here the purpose of this measurement is to establish formulae of aggregate productivity; we do not think, at the present stage of educational planning in Africa in any case, that it has any practical significance.

---

[1] Cf. for Algeria: C. Vaugrante, "Financement et rendement du système scolaire algérien", 1965, p.52

2. On the other hand, there is no doubt that certain choices should be made in the light of productivity studies, e.g. in choosing between alternatives facing many governments, such as:

- new teaching methods (television, radio, programmed teaching or traditional methods;
- formal technical education, or on-the-job training;
- rural terminal primary classes, or alternate periods on pilot farms; and so on.

These kinds of alternatives demand precise data on the measurement of output in relation to cost and other production factors.

3. The numerical measurement of output (production and yield) is the planner's instrument board, showing, at the diagnostic stage, the sources of waste and delay, and the bottle-necks; allowing him to find out the least tolerable imbalances and to evaluate and possibly correlate them.

At the projection stage, the utilization of output rates is indispensable in calculating future enrolments.

Hitherto, in practice, it is mainly the measurement of output which has been refined and used by planners, who consider it the best, perhaps the only, statistical working tool. We have shown that the measurement of production (and not only of output or yield) can also reveal imbalances.

4. The subjective measurement of output is in general used for purely pedagogical studies and rarely have educational planners been able to consider its significance as a criterion for the internal validity of a system.

Nevertheless, this measurement does not involve major elaboration difficulties, but planners and educationists have here found no common language. The research they have carried out, mainly in secondary teacher-training colleges, does not provide for its application to planning because it ignores the under-lying problems. This is a sector which calls for team work and should lead to a knowledge of the internal reality of educational systems. Does the educational system function sufficiently well to provide the level considered optimum by the planner? This is the question to which the subjective measurement of output can partly provide the answer.

5. It can be stated on the other hand that if the objective measurement of output is usually not taken into account by educational planners, the reason is a lack of interest in widening the boundaries of education and linking it up with economic and social development.

We considered it urgent to demonstrate that the reform of educational content can be envisaged only after collecting the essential data on the adaptation of school-leavers to the actual employment conditions in any specific country.

Any measurement of educational productivity which ignores this criterion risks leading to the institution of dangerous educational reforms. The difficulties involved in this measurement of output do not seem to us to be overwhelmingly difficult in Africa. Commensurate means ought to be provided but, at present, only a few occupational guidance offices publish studies which are patchy, and isolated from the context of educational planning.

6. Each progress in the measurement of output requires a multidisciplinary team research where educationists and experts in assaying could play a fundamental role.

PART C CASE STUDIES

PRODUCTIVITY TRENDS IN BRITISH SECONDARY EDUCATION, 1950-1963

by M. Woodhall

CONTENTS

Pages

I. The justification for productivity measurement in education VI - 2

II. The measurement of secondary school output VI - 5

III. Alternative indices of output for secondary schools 1950-1963 VI - 11

- (i) Economic Index VI - 12
- (ii) Length-of-schooling Index VI - 14
- (iii) Academic Index VI - 15

IV. Index of Inputs 1950-63 VI - 20

- (i) Teachers' time VI - 21
- (ii) Pupils'time VI - 22
- (iii) School buildings VI - 24
- (iv) Other educational goods and services VI - 27
- (v) The relationship between Output and Input VI - 28
- (vi) Implications for Policy VI - 33

CONCLUSIONS VI - 37

Footnotes VI - 41/48

Appendix I VI - 49

Appendix II VI - 50

Appendix III VI - 51

Appendix IV VI - 54

Last year, local and central government expenditure on secondary education totalled over £400 million. How effectively was this money spent? Annual expenditures on secondary education have risen since 1950 from about £50 per pupil to £150 per pupil. Was this increase largely due to the costs of better quality education? Are our schools successful in achieving their objectives, or could they be more efficient? Such questions have been asked throughout educational history; they are good questions, but they have never been answered satisfactorily. To answer them it is necessary to measure the productivity of education, which involves defining and measuring the output and inputs of schools in such a way that changes in the standards and quality of instruction are taken into account. Without a measure of educational productivity in this sense, it is impossible to judge how effectively scarce resources are being utilized in schools. Yet despite urgent demands for more schools and more teachers, and despite the recent emergence of the economics of education, questions about the productivity of schools or the effectiveness of educational expenditure remain unanswered because we lack the evidence needed to answer them.

This paper explores the problems of measuring educational productivity by way of an analysis of trends in the productivity of British secondary education.[1/] We discuss a number of different ways of measuring educational output, and construct a productivity index for British secondary education since 1950, based on three different measures of output. Any conclusions about trends in educational productivity depend on what definition and measure of output is adopted, but our three measures of output all indicate the same trend: a decline in productivity. Our major finding is that whatever definition of quality we adopt, it takes more resources today to produce a secondary school-leaver of given quality than it did in 1950. It is usually assumed, though without evidence, that productivity in education is constant or perhaps rising. The evidence presented here, however, suggests the very opposite.

This is a disturbing conclusion with implications for educational policy that will be discussed below. Some educationists, however, will object at the outset that productivity is not a concept that can be applied to education. We start, therefore, by examining these objections to the notion of educational productivity.

I. The Justification for Productivity Measurement in Education

The term "productivity" denotes the ratio of some specified output to the inputs of resources required to produce it. If output is a saleable product it is convenient to measure it in monetary terms, but in fact output can be measured in any terms whatever. Thus, productivity measurement need not be confined to profit-making business enterprises. Provided that the aims and objectives of a process can be defined, it is possible to measure its output in terms of those objectives. To measure productivity means simply to specify how costly it is, in terms of money, time, effort or any other input, to achieve given objectives. The purpose of measuring trends in productivity is to indicate the changing efficiency with which objectives are being attained.[2/] The concept of productivity is just as relevant, therefore, to education as to a manufacturing industry, as educators are just as concerned as everyone else about using scarce resources with maximum effectiveness. Yet some educationists have objected to productivity measurement in education on the grounds that it must distort their aims; aware of this attitude, one economist spoke of the widespread "misapprehension that the effort to increase efficiency necessarily and ordinarily changes the goals of education".[3/] Is it in fact a misapprehension or are there genuine grounds for fears?

Opposition to productivity measurement seems to stem from a belief that there is a fundamental clash between economists and educationists over quantity and quality in education.[4] Educationists are afraid that measurement of the productivity of schools will involve emphasizing quantity at the expense of quality, if only because the quality of education is so difficult to measure. In fact, some critics go further and suggest that the most important educational objectives are in principle immeasurable, concerned as they are with a child's whole personality and character; in the words of one writer, "anything measurable enough to satisfy the economist is likely to appear disgustingly mundane to an educationist who is more concerned with the soul".[5]

The debate about the feasibility of measurement in education has a long history, on both sides of the Atlantic. In Britain there was the experience of the unpopular system of "payment by results" for elementary school teachers in the third quarter of the nineteenth century; in America there were frequent expressions of alarm in the inter-war years about the application of business values and practices to education in the effort to improve school efficiency.[6] In both countries there was bitter opposition from teachers, who alleged that such measurement emphasized the wrong criteria. Unfortunately, opposition to an ill-conceived system of payment for teachers and to ham-fisted measures of efficiency soon hardened into opposition to all measurement of cost-effectiveness in education. However, every judgement about the benefits of new methods of teaching, the advantages of one system of school organization over another, and indeed any assertion about improvements in the educational system, implies that we can directly compare educational outcomes which in turn implies a basis for cost-effectiveness comparisons or productivity measurement. The goals of education are so complex that we cannot expect to find a single unit of measurement to cover all educational outcomes, but this should lead to a search for a wide range of complementary measures, not the abandonment of all attempts at measuring productivity. Faced with a similar predicament, educational psychologists now recognize that simple IQ-tests are inadequate measures of children's abilities and that it is an oversimplification to think of intelligence as a single entity; but far from avoiding measurement, they have now developed various batteries of tests which measure different facets of intelligence or ability.[7/]

There is no single definition of the purpose of education, so that there cannot be a single measure of output. Therefore economists must accept that the measurement of educational output calls for a number of measures corresponding to the many different purposes and objectives of educators and these must include qualitative as well as quantitative indicators. But at the same time, educationists must recognize that if they deny the possibility of measuring educational output or quality this is tantamount to admitting that schools have no way of judging how successful they are in achieving whatever they set out to do. In reality, any dispute between economists and educators is not about whether it is possible to measure productivity, but about the validity of different measures. Educators fear that the effort to increase efficiency will affect and change the goals of education because they suspect that economists will define "efficiency" in solely financial terms and that concern about "value for money" will inevitably lead to exclusive emphasis on immediately useful skills. To be sure, the production of skilled manpower is one of the purposes of the educational system, and thus the productivity of schools can be measured in terms of their responsiveness to the demands of the labour market for different skills. But vocational preparation is only one of the teacher's aims. The next section will examine some alternative ways of measuring the quality of secondary school output in a review of the relevant literature, which is a necessary introduction to our own results.

II. The Measurement of Secondary School Output

The effects of schooling fall into many categories, but ultimately all must be measured in terms of changes in the children who pass through schools. Some of these changes can be measured while the child is at school: the school's effectiveness in teaching certain skills, such as reading, can be measured by pupils' performance in tests, and performance in particular subjects can be measured in terms of form-grades or examination results. However, teachers are not concerned only with the immediate short-term effects of schooling, like the ability to pass tests, but also with the many long-term effects of schooling which appear after a child has left school. One of the major objectives of schools is to prepare pupils for their adult roles and their success in this respect must be judged by looking at the subsequent careers of school-leavers. Any valuation of the output of schools should include both "in-school" and "after-school" measures of pupil performance.

Probably the easiest way of measuring how successful a school is in teaching particular subjects or skills is by comparing the achievement of pupils in specially designed tests. If tests of the same standard are given at the beginning and end of a course, variation in test-scores give some idea of the "value added" by the course and can therefore be used as an index of educational output. Variations in pupil achievement can also be related to various input variables to determine the influence of a particular set of factors on pupil performance. An example of this approach is the US Office of Education's

Project Talent, in which pupils in a random sample of 1,000 secondary schools are given periodic tests of attainment; variations in pupil-scores are then analysed with respect to a wide range of school and community variables, such as per-pupil expenditure, class and school size, qualifications of teachers, occupational and educational level of adults in the community, and so forth. Preliminary findings suggest that factors such as the level of teacher salaries, the experience of teachers, per-pupil expenditures, and library facilities are very closely associated with pupil achievement in standard subjects such as English and Mathematics and with attendance and drop-out rates, but factors such as school size, average of class, and age of school buildings appear to have very much less influence on pupil achievement. This sort of analysis may explain variations in the effectiveness of schools in achieving short-term objectives, but class grades and test-scores do not capture the long-term effects of schooling. However, Project Talent will eventually also throw light on these long-term effects as it is intended to follow up a smaller sample of school-leavers into higher education or employment.

A similar study, on a smaller scale, has been carried out in the State of New York. Known as the Quality Measurement Project, this also attempts to analyse variations in pupils' standardized test-scores with respect to experience of staff, average expenditure per pupil, and socio-economic status of the community.[9] The purpose of these and other similar projects is not to measure productivity, but to help explain variations in the productivity of different school systems by demonstrating which input variables have the greatest influence on educational outcomes. In America such research is made possible by the fact that about 90 per cent of secondary schools already use standardized tests as a means of assessing their pupils. In Great Britain, on the other hand, any large-scale study would first need to establish standardized testing in schools.

Many studies in this country have been limited to small samples of schools and have studied the influence of one factor, or a small group of factors, on the performance of pupils in specially administered tests. For example, the National Foundation for Educational Research is at present studying the effects of streaming by comparing the achievements of children from streamed and unstreamed classes. Other factors which have been isolated for special study include emphasis on formal subjects at the expense of creative work,[10] techniques of teaching in primary schools,[11] and school and class size.[12] Not surprisingly, the evidence from such research is frequently conflicting: one research worker, for example, finds that school size has an important effect on the attainments of pupils, while another finds it a relatively insignificant factor. One reason for this is that school and environmental variables interact to such a degree that isolation of one variable may give misleading results. The question of which factors have the greatest influence on pupil achievement demands multivariate analysis to isolate the interaction between variables so as to reveal the pure effect of a single variable.

Multiple regression analysis was used by Kemp in 1955 to study the effects of socio-economic and school factors on test-scores of primary school pupils.[13] More recently, the Manchester University School of Education has carried out surveys among secondary school children in Manchester and Salford which revealed, like Kemp's earlier study, a close interaction between social factors, such as parents' socio-economic level, and school factors, such as size of school and size of class.[14] On other issues, however, the results are conflicting. Kemp found that progressive teaching methods had comparatively little effect on pupil attainment, but that the overall size of school was important, whereas the study of Salford schools fround that the reverse was true. More research at both the primary and secondary levels in areas with different socio-economic characteristics is needed to settle this and similar issued.

All these projects were designed to explain which school or community variables affect standards of achievement, rather than to measure variations in quality over time or in different areas, but such comparisons, of course, can be made by using test-scores. The Manchester studies, for instance, compared the average attainment of children in basic subjects (Reading, Spelling and Arithmetic) in 1951 and 1957 and the authors concluded that their finding of a substantial improvement in average test-scores in these subjects was one of the most significant results of their research.[15/] It is impossible to use this evidence as a measure of the quality of education in the country as a whole, since the pupils tested were not a representative sample, but it does demonstrate the possibility of translating increases in standards of performance into quantitative terms.

There are two surveys that provide information about the achievement of a representative sample of school pupils, but each is concerned with achievement in only one subject. In 1948 the Ministry of Education conducted a national survey of reading attainment among primary and secondary school children, and there have been four later surveys of reading ability in 1952, 1956, 1961 and 1964. These surveys show considerable improvements in the average level of reading comprehension of 11 and 15 year old pupils.[16/] A large-scale international comparison has recently been completed of levels of achievement in mathematics, and specially designed tests have been administered to samples of secondary school pupils in twelve different countries.[17/] The purpose of this project was to compare standards of performance in this one subject in the participating countries and to relate these standards with various aspects of school organization, such as the degree of comprehensiveness or streaming, and with social factors, such as social class composition. Standards of achievement were compared not only in terms of average scores, but also the proportion of pupils who reached specific levels, and some extremely interesting evidence of international differences emerged from this study. Neither of these projects, however, gives any indication of levels of achievement in other school subjects, although the UNESCO project on international comparisons of achievement is now being extended to cover more countries and a variety of school subjects. It would be misleading to use standards of achievement in one subject alone as a general measure of educational output. The assumption that an improvement in standards of reading skill will be accompanied by corresponding improvements in other subjects of the curriculum may not be justified; in some cases, a rise in standards in a basic skill, such as reading, may be achieved at the expense of work in other, more complex subjects.[18/] In an underdeveloped country with high rates of illiteracy, an improvement in average reading ability could be interpreted as an improvement in educational quality. But in a country which aims to provide a balanced education in a wide range of subjects, an improvement in reading standards without any evidence of achievement in other subjects is more difficult to interpret. An international comparison of the achievements of 13 year olds in five subjects showed that there was considerable variation in the emphasis on different subjects among the twelve countries.[19/] England was ranked first in terms of scores in non-verbal aptitude tests, last in geography, below average in mathematics and above average in reading comprehension and general science. This illustrates how unsatisfactory it would be to measure the quality of education by looking only at achievement in a single subject.

Standardized test-scores, if available for a representative sample of the school population would provide one useful measure of educational quality by indicating how much pupils know in particular subject-fields. Objections are often made to tests on the grounds that tests cover only particular areas of the subject or measure rote-learning rather than genuine comprehension. These are really questions about test construction, and there is now a considerable literature on the problems of test construction that deals with most of these objections.[20/] However, as we noted earlier, in Great Britain there is no evidence on the performance of large samples of secondary school pupils in a range of subjects which could be used to estimate changes in levels of attainment over time.

If such information were available it would measure schools' success in fulfilling one function, the transmission of knowledge, but measures of other objectives would also be needed. One of the goals of education is to raise levels of cultural appreciation, and some quantitative measures have been suggested for this, such as membership of public libraries, sales of art reproduction or theatre tickets, but it is impossible to separate the influence of education from the influence of mass communication and rising incomes on changes in consumption patterns, so that these indices cannot be regarded as measures of the contribution of schools to cultural change. Tests of cultural awareness and creativity have been devised by educational psychologists, and also tests of moral or social values, but there have been practically no attempts to use such tests to judge the effectiveness of schools in these respects.[21/] If we take the view that one of the aims of education is to promote social mobility, evidence on the proportion of working class pupils remaining at school beyond the school-leaving age, or going on to higher education, would be relevant for the measurement of output. Thus, the evidence of sociologists that there has been no significant narrowing of class differentials in access to universities since 1944[22/] would suggest little increase in output defined in terms of equality of educational opportunity for children of different social classes.

However, measures of output which depend upon specially administered tests or analysis of pupils' social class origins are more suitable for comparisons of the output and productivity of individual schools, than for the study of an entire level of the education system. In the next section we suggest a number of measures of output which can be derived from official statistics. Our analysis excludes independent schools, because of the lack of necessary data, and is confined to maintained secondary schools in England and Wales.[23/]

III. Alternative Indices of Output for Secondary Schools 1950-1963

The simplest measure of secondary school output is the annual number of school-leavers. A trivial measure of productivity is simply the reciprocal of average costs per school-leaver. Between 1950 and 1963, the number of school-leavers from maintained schools rose from 476,427 to 642,550, an increase of 35 per cent. If we adopt this as an index of output, and measure productivity by costs per school-leaver measurement of productivity trends reduces to a comparison of the size of the school population with total expenditures on secondary education: productivity can only rise if per pupil expenditures decline. It is precisely the fear of this sort of naivety that has caused so much opposition to productivity measurement among teachers in the past. Changes in the quality of education - however elusive a concept this may be - must be allowed for by some method of weighting school-leavers by their educatinnal attainments. We have already outlined the difficulties of obtaining any direct measures of quality which could be used as weights; for the following calculations, three different weighting systems have been adopted, based on proxy measures of quality.

(i) Economic Index

One of the purposes of schooling is to prepare children for their future careers, so that one way of measuring the achievements of secondary schools is by looking at the occupations of school-leavers. An economic criterion of quality is the earnings which the school-leaver can command in the labour market. If each school-leaver is weighted by his relative earnings, this provides a measure of output which reflects the vocational value of different types of levels of secondary schooling. One problem is then the school-leaver who does not enter employment but goes on to some form of higher education. His immediate earnings are zero (in fact negative, because of the costs he will incur by pursuing his education) but his lifetime earnings will be higher than if he had completed his education at the age of 18. Strictly speaking, this increased income is the "product" of higher education, rather than secondary education. However, a certain level of attainment (for instance, three G.C.E. "A" level passes) is a necessary prerequisite of higher education, and so the achievement of this level provides the student with the opportunity to continue his education at a higher level. It has been suggested that when calculating the economic benefits of various levels of education, one must add to the direct returns of one educational level the cash-value of the option to continue to the next level.[24/] In the same way, when weighting school-leavers by the economic value of their educational attainments, it is necessary to include the value of the option to go on to higher education as part of the product of secondary schools.

To construct such a set of economic weights, we need to differentiate school-leavers by level and type of courses completed, and to calculate the present value of the average lifetime earnings of each group of school-leavers (including the "negative earnings" incurred during higher education). In fact, no suitable income by education data exists for this country. The best data available come from two sample surveys carried out in 1961 and 1962, and show the average incomes of men and women of different ages in three groups: those with a terminal education age (TEA) of 15, 16-18, or 19 and over.[25] This data is far from ideal; details were collected of incomes, rather than actual earnings, and these are analysed according to length of education rather than level of attainment or type of course. The information about women's incomes was not accompanied by details of how long the women had been working or whether their working lives had been interrupted by marriage, so that it is difficult to calculate life-time incomes for women. Unfortunately, attempts to launch a large-scale sample survey designed to collect better information on the relationship between education, occupation, and earnings have so far been unsuccessful. A further difficulty is that there are no comparable data available for the period before 1961. However, the data, such as it is, can be used to construct rough weights which reflect the purely economic value of staying on at school beyond the minimum school leaving age.[26]

In each year, school-leavers are divided into three groups: those who enter employment at 15 are weighted by the relative earnings of men or women with a TEA of 15; those who enter employment at 16-18, or who go on to further education at 15 or 16, are weighted by the earnings of those with a TEA of 16-18; the remainder, who go on to further education at 17 or over, or enter employment at 19, are weighted by the earnings of those with a TEA of 19 or over. These weights assume that the earnings differentials associated with education have not changed between 1950 and 1961; this assumption may well be false, but in the absence of information, no other assumption was possible. Even these crude weights, however, demonstrate quite clearly a considerable increase in the quality of school-leavers, when evaluated in terms of a purely economic criterion. Between 1950 and 1963, there was an increasing tendency for secondary pupils to stay on at school beyond 15. This is reflected in the "economic" index of output since staying on at school raises pupils' income expectations, so that whereas between 1950 and 1963 the unweighted output of school-leavers rose by only 30 per cent, the "economic" index rose by 46 per cent.

(ii) Length-of-Schooling Index

The justification for economic weights is that extra education raises the earning capacity of school-leavers, and the index therefore emphasizes the role of schools as producers of educated manpower. This criterion of quality would be rejected by teachers who value learning for its own sake, rather than for its vocational implications. According to this point of view, school-leavers might be weighted by the length of their schooling, rather than by their future earnings. This method of weighting assumes that one of the aims of schools is to foster a desire for education, and so measures their success in terms of the number of pupils persuaded to stay at school beyond the statutory age. Thus, if many pupils drop out of school at the earliest possible opportunity, output is judged of lower quality than if a high proportion choose to stay on in the sixth form. One disadvantage of this weighting system is that the tendency for children to stay longer at school reflects external pressures as well as the efforts of schools. However, it seems reasonable to judge schools as more successful in 1963, when 34 per cent of the relevant age group remained at school beyond the statutory age, than in 1950, when the proportion was only 22 per cent. It is also reasonable to assume that the longer a child remains at school the more knowledge or skill he acquires, which is further justification for using the average length of schooling of each school-leaver as a proxy measure of quality.

Research also suggests that staying on at school beyond the statutory age improves pupils' performance in IQ tests.[27] If children who stay at school after fifteen actually become more intelligent then the quality of school output has clearly risen since 1950, simply because more children stay at school beyond that age. If school-leavers are weighted by the length of their education, the index of output rises by 38 per cent between 1950 and 1963, compared with an increase of 30 per cent in the unweighted index.

(iii) Academic Index

Both the "economic" and the "length-of-schooling" indices emphasize the level of education a pupil attains, rather than his academic achievement, or the type and variety of courses followed. Some economists suggest that this is not unrealistic: "Much of what schools accomplish is less the outcome of what they teach than of the simple fact of having graduated from them".[28] However, this approach could lead to considerable underestimates of educational productivity if the standards and content of school courses change more rapidly than the amount of schooling pupils receive. The only measure of performance which can be applied to school-leavers throughout this period is attainment in General Certificate of Education examinations, and the great increase in the number of G.C.E. passes since 1951 (when the examination was first introduced) does provide evidence of steady improvement in the quality of secondary school output. Between 1951 and 1963, when the number of school-leavers rose by 35 per cent, the number of G.C.E. 'O' level passes rose by 190 per cent and the number of 'A' level passes by 155 per cent. However, this remarkable increase was partly due to changing standards, and other deliberate changes in policy, and cannot be interpreted simply as an increase in output. When the G.C.E. was first introduced in 1951, the Ministry of Education restricted the number of examinees by imposing a minimum age requirement of 16 and, at the same time, urged schools not to enter candidates for a large number of subjects. It was suggested that a pupil should not sit at 'O' level for any subject that he would later take at 'A' level, and a circular sent out to schools stated "There is nothing to be gained by seeking a large number of 'O' level passes".[29/] Since 1951, however, the age restriction has been relaxed, and there has been an increasing tendency for schools to enter more candidates, each sitting for more subjects. Another important change has been the increase in the number of technical and modern school candidates: in 1951 only 7 per cent of all maintained school entrants came from schools other than grammar schools; by 1963 this proportion had risen to 40 per cent. However, despite the enormous increase in the number of entries, the ratio of passes to entries has remained roughly constant; if this reflects a deliberate policy-decision, it would imply a change in standards.[30/] Therefore, in several respects the number of passes in 1951 and 1963 are not fully comparable.

Some critics would in any case deny that G.C.E. achievements provide a good criterion of secondary school success. A recent article in the Times Educational Supplement, for example, referred disparagingly to schools which are " 'O' Level pass factories, content with and even proud of their mediocrity",[31/] and Brian Jackson, Director of the Advisory Centre for Education, commenting on schools which allow pupils to "collect" 'O' Level passes, said "Fifteen 'O' Levels represents neither breadth nor brilliance, but a kind of education lunacy".[32/] Some of this opposition to G.C.E. is, in fact, based on objections to any sort of external examination. The Secondary Schools Examination Council has summed up such objections: "The examination dictates the curriculum and cannot do otherwise; it confines experiment, limits free choice of subject, hampers treatment of subjects, encourages wrong values in the classroom" etc.[33/] At the moment, attempts are being made to widen the scope of examinations in order to meet some of these criticisms. Proposals currently being considered by the Schools Council aim to increase free choice of subjects and to reduce specialization in sixth forms by allowing pupils to take both "major" and "minor" subjects at Advanced Level. The examinations which have been introduced so far for the new Certificate of Secondary Education allow wide variations in the treatment of subjects, and provide teachers with opportunities for creating their own "school-based" examination syllabuses.[34/]

Whatever the arguments for or against external examinations there is one serious objection to using G.C.E. attainments alone as a measure of secondary school output. The examination is expressly designed for the top 20 per cent of the ability range, and until the Certificate of Secondary Education was introduced last year to cater for the next 40 per cent the majority of school-leavers were unable to offer any evidence of the standard they had reached in school. Yet examination results are one of the few available indicators of educational quality. It was partly due to pressure from employers, who use examination results as a selection device, and to demands that more children should have the chance to demonstrate their standard of attainment that the external examination system in Britain has been broadened to cater for a wider ability range. At the same time secondary modern schools, which were initially designed to be free from external examinations, have increasingly entered candidates for G.C.E. Ordinary Level examinations. It is obvious that although individual educators may criticize examinations, one of the accepted aims of schools is to prepare pupils successfully for examinations. Achievement in G.C.E. is therefore one relevant criterion of educational quality, and our "academic" index measures output in terms of G.C.E. results; school-leavers in each year since 1953 are weighted according to the number of passes they have achieved.[35] If one accepts this criterion of quality the output of secondary schools rose by 67 per cent between 1953 and 1963, whereas the unweighted number of school-leavers rose by only 30 per cent.

Whatever assumptions about objectives we adopt, the quality of the output of British secondary schools has risen since 1950. Charts 1 & 2 show the values of the three weighted indices beside the unweighted index, based simply on numbers; in every case the weighted index is higher.[36] Chart 3 shows the estimated increases in the quality of output, based on the three specified criteria. In 1963 pupils on average stayed at school longer, more leavers were qualified to enter higher education through obtaining G.C.E. passes, and school-leavers could look forward to higher lifetime earnings as a result of their education. These three indices of output suggest that since 1950 the increase in the "quality" of educational output has been between 8 and 32 per cent. Thus, whether one chooses to value education for its own sake, as consumption, or as a form of investment, schools have increased the value of their output by motivating more pupils to remain in school. But what of those who leave school at fifteen? The only concrete evidence we have of their attainments is from the Ministry of Education surveys of reading ability. These surveys showed that between 1948 and 1961 there had been an increase in the "pace of learning to read" of between 14 and 24 per cent.[37] We have already discussed the limitations of using tests of reading alone as measures of educational quality, but this evidence does support our findings of an increase in the quality of secondary school output between 1950 and 1963.

The exact order of magnitude of the increase in educational quality depends, of course, on what definitions or assumptions one adopted. But it is clear that the quality of education provided in British secondary schools has risen. The next section will consider what this increase in output cost in terms of human and material resources.

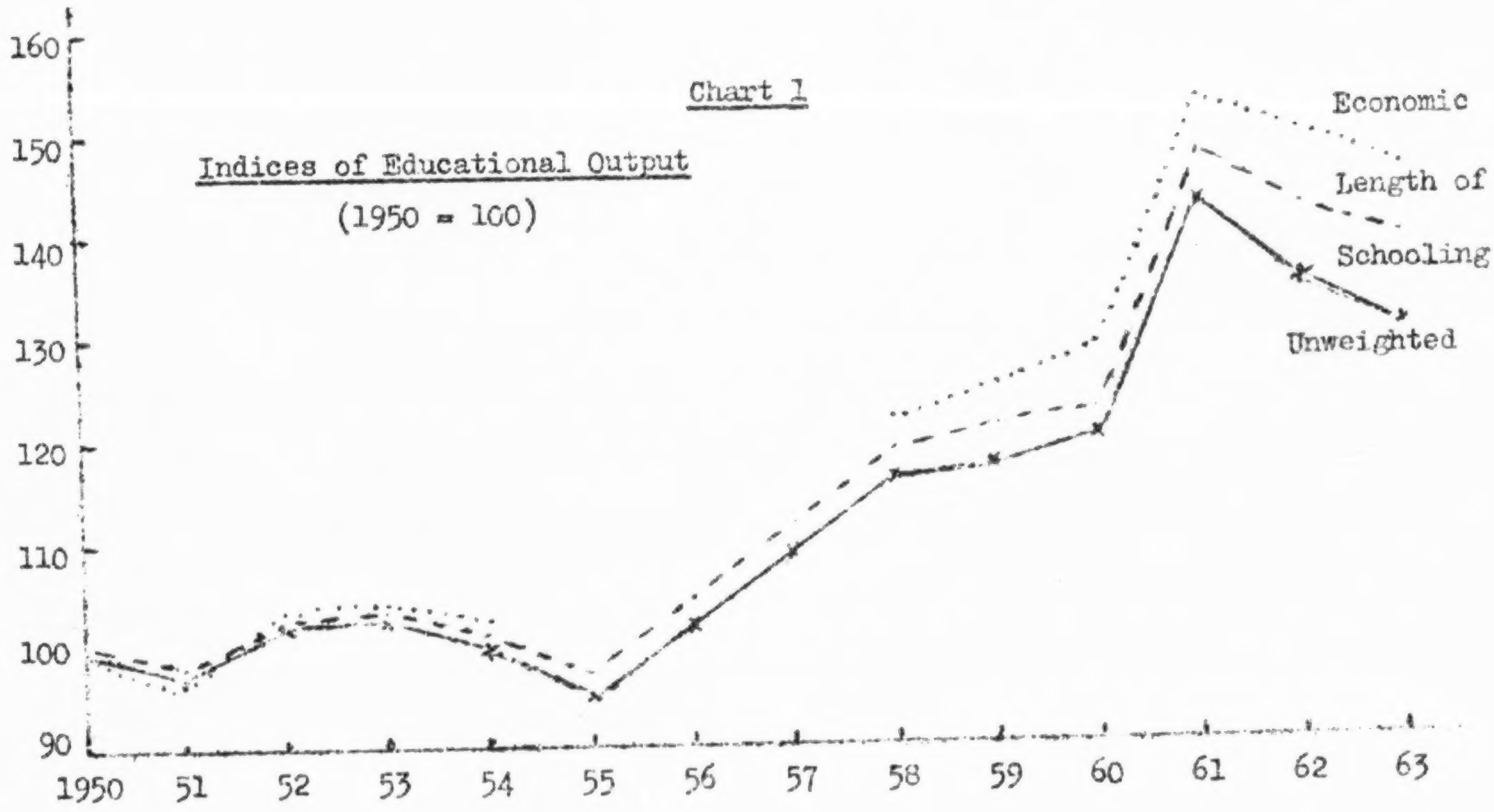


Chart 1

Indices of Educational Output

(1950 = 100)

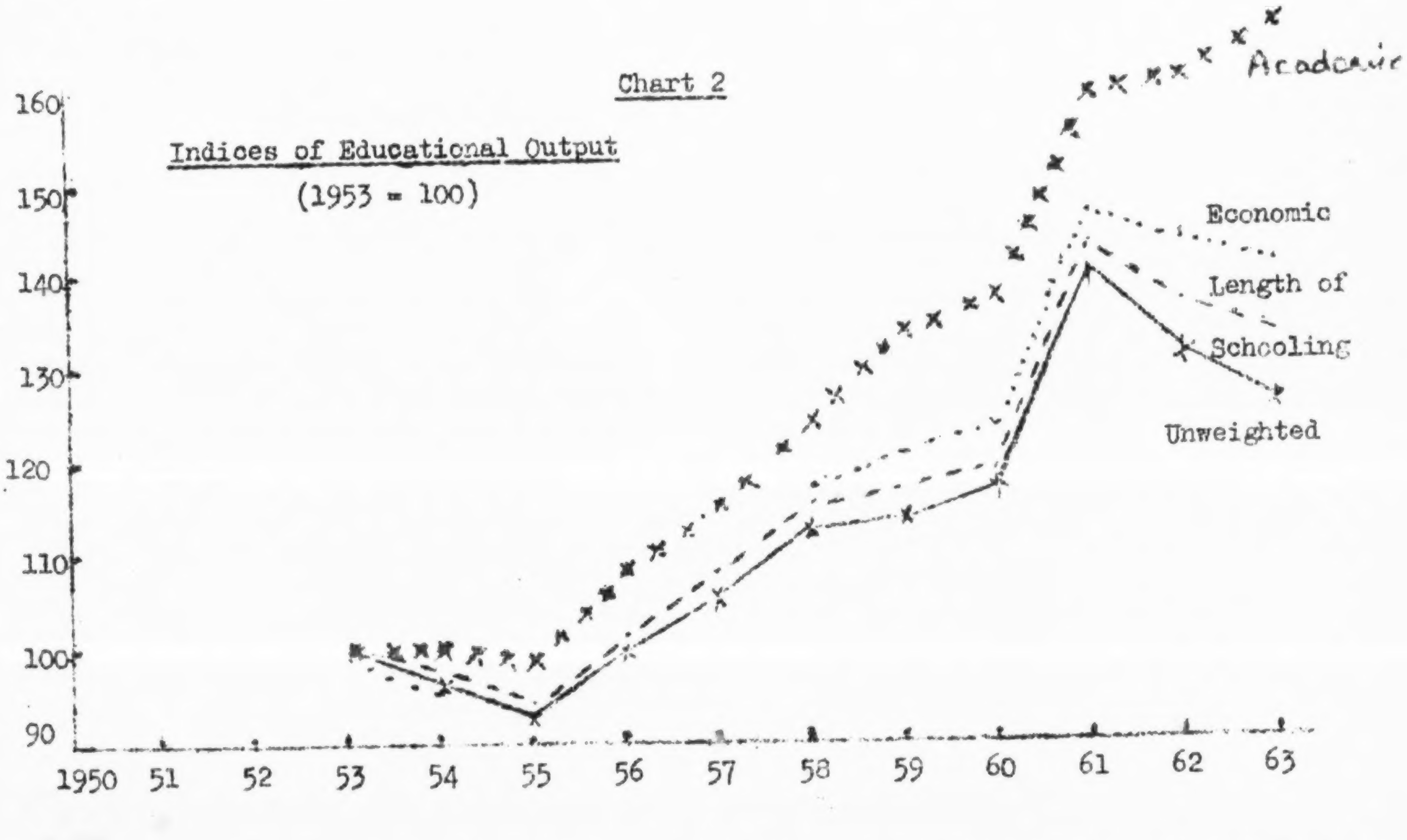


Chart 2

Indices of Educational Output

(1953 = 100)

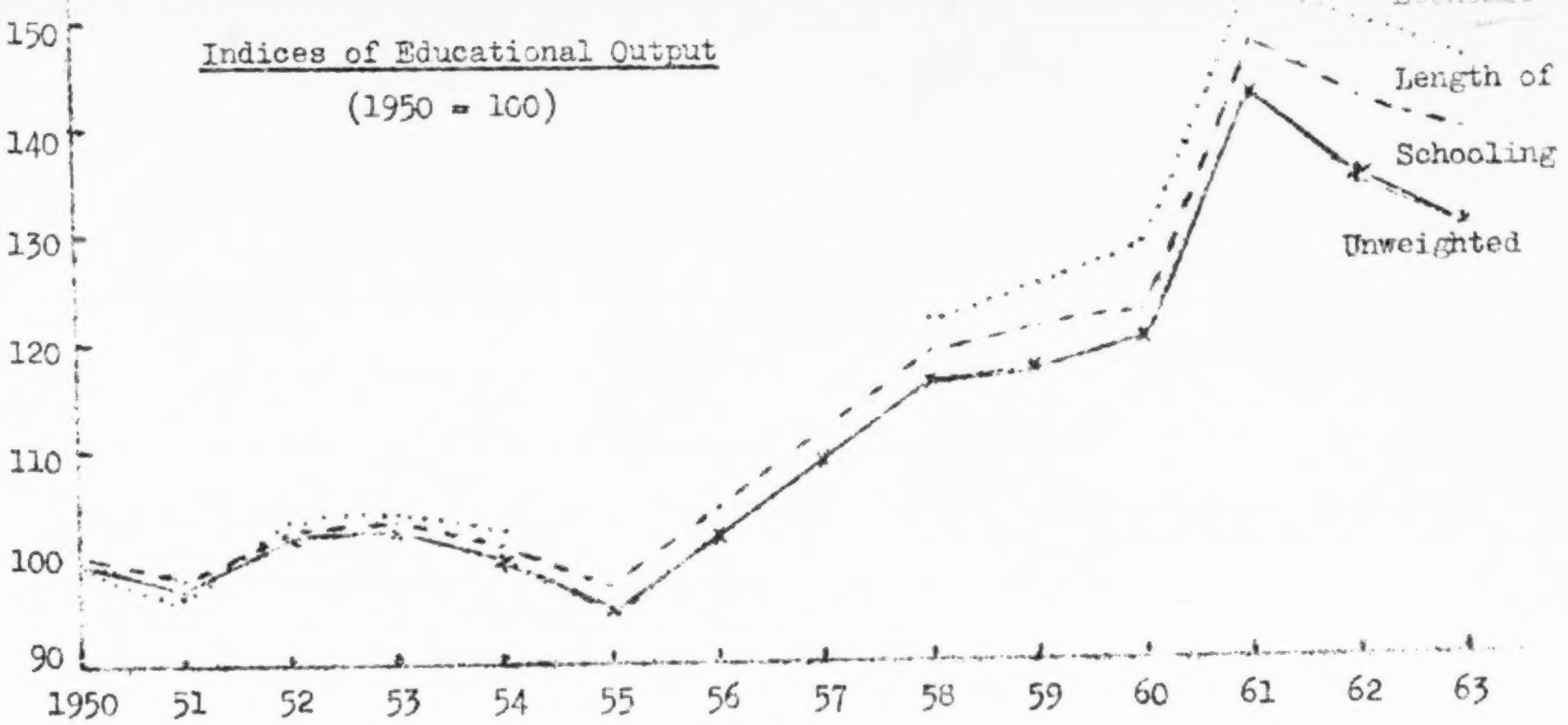


Chart 2

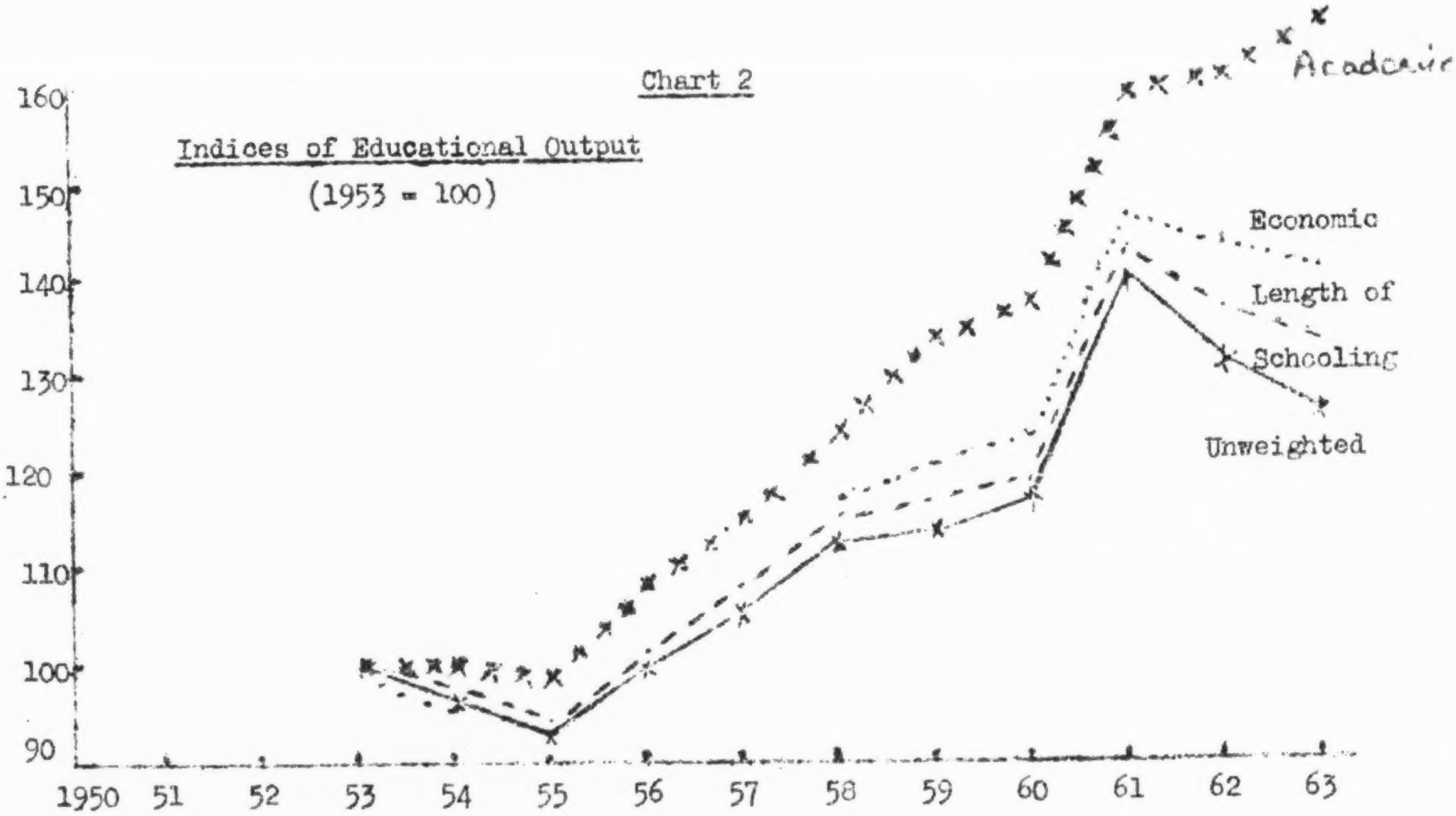
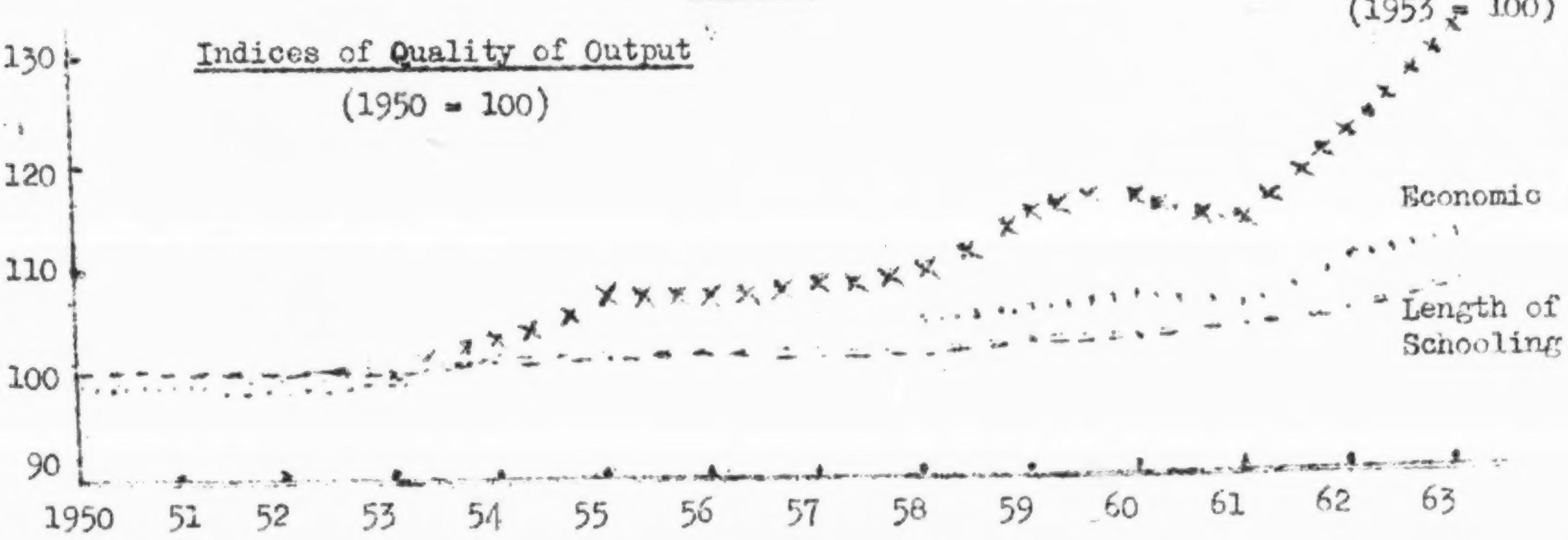


Chart 3



IV. Index of Inputs 1950-1963

In order to compare the increase in secondary school output with the corresponding increase in inputs, we need to measure all inputs in physical terms, making allowance, where necessary, for any changes in quality. The resources which are used up in the educational process are the time of teachers and administrative staff, the time of pupils, books, stationery and other materials, fuel for lighting and heating, equipment and school buildings. It is impossible to find a single physical unit which could express such an assortment of factors, so the alternative is to measure every input in terms of its money value. This solves the problem of adding together the time of a teacher, and the use of a desk, but creates other problems. For instance, prices have risen since 1950, and the prices of educational inputs have not all risen in equal proportions. What we have done, therefore, is to take the money value of each input, and to divide this by an index of that factor to provide an approximate measure of changes in the physical quantity of goods or services used in schools, which is independent of changes in the purchasing power of schools' money. We adopted a system of base-year weights, rather than current year weights; a separate input index was calculated using 1963 price weights, but this did not affect the final productivity trends.

Some money values had to be imputed because schools do not purchase all their resources. For instance, schools do not have to buy the time of pupils (which can be regarded as the raw material of the educational process) nor do they rent buildings. Yet neither of these inputs is free. For an analysis of productivity we need to calculate the total opportunity cost of education, that is the total value of any goods and services used in the educational process that have an alternative use. Both students' time and school buildings could have alternative uses, so that both have a positive opportunity cost, and some money value must be ascribed to them.[38] Our final estimate of total inputs is therefore greater than total expenditure on secondary education because of these imputed values. At the same time some items of school expenditure are excluded, for instance expenditure on meals and milk, as these do not contribute to the educational activities of schools, and therefore cannot be realted to the output of schools defined in terms of their teaching function.[39]

(i) Teachers' Time

The value of teachers' time can be calculated from expenditure on salaries; between 1950 and 1963, total expenditure on secondary school teachers' salaries rose from £43 million to £181 million.[40] The size of the total salary bill is determined by three factors: (1) the number of teachers; (2) their age and qualifications; and (3) current salary scales. For the purposes of estimating the real input of teachers, we need to measure changes in the number of teachers, and also their qualifications and age, since these reflect changes in the quality of the teaching profession;[41] but changes in salary rates must be excluded. Teachers' salaries in real terms are therefore estimated by deflating the current money values by a specially constructed index of teachers' salary rates.[42] This shows the increase in teachers' salaries assuming constant purchasing power of money over teachers since 1950. In real terms, teachers' salaries doubled between 1950 and 1963, although the increase in the number of teachers was only 72 per cent. This therefore indicates a rise in the quality of teaching staff, as reflected in their relative salaries.

The question remains whether teacher quality has changed in ways which are not reflected in their salaries. Despite much research on the problems of evaluating teacher effectiveness, we have few satisfactory definitions, still less indicators, of high quality teaching. Two recent surveys[43/] of well over 100 studies of teacher quality provide very few definition conclusions, mainly because of this difficulty of definition. In such a state of confusion we have, therefore, only allowed for the quality factors which are reflected in salary differentials.

Table 1. Teachers' Salaries

Money		1950-1951	1963-1964
Money value	(£m)	42.8	198.3
Real Terms (1950 prices)		42.8	90.2
Index	1950 = 100	100	210

(ii) Pupils' Time

The input of pupils' time is more difficult to measure. There is no money value for this, and from the point of view of the schools it is a free input. Yet if these pupils were not in school, many of them would be working, and the total supply of goods and services in the economy is diminished by keeping them in school. The opportunity cost of the time of pupils over 15 can be measured by the wages which they sacrificed by remaining at school beyond the school leaving age. The total earnings foregone by schoolchildren therefore represents the money value of their time.[44/] This was the measure adopted by the Crowther Committee when it estimated the total cost to the economy of raising the school leaving age.[45/] The actual calculation of the imputed value of pupils' time is complicated by the fact that there is little data on the earnings of young people in different age groups. However, the Crowther Committee estimated that in 1957, the average earnings of 15-16 year olds were about £200 a year. The Robbins committee made a similar estimate of the earnings foregone by students in teacher training and further education colleges in 1962-1963; their estimate was £540 a years.[46] By interpolating from these figures for 15 and 18 year olds, and by taking account of the trend in the average earnings of all young people over the decade of the 1950s, we can estimate the earnings foregone by schoolchildren in each age group since 1950.[47] Since there are no earnings foregone by schoolchildren below the age of 15, our estimate of the money value of pupils' time only takes into account numbers in school above the statutory age.[48] The imputed money value of pupils' time must be deflated by an index of juvenile wage rates[49] to provide an estimate of the real value of pupils' time.

Between 1950 and 1963 the total real value of pupils' time increased by over 160 per cent; this substantial increase is mainly the result of the upward trend in staying at school beyond the minimum leaving age.[50]

Since our measure of pupil input is based on the opportunity cost of pupils' time, it measures some changes in the quality of pupils: pupil input in 1963 was of a higher quality than in 1950 since it included a higher proportion of sixth form pupils, and this is reflected in our index. However, it is sometimes suggested that the average level of intelligence of schoolchildren is rising, and this aspect of input quality is not reflected in our figures. There is no evidence on the general level of intelligence or ability of schoolchildren which could be used to hold this quality factor constant. In Scotland, two national surveys were conducted in 1932 and 1947 to test the hypothesis that there had been a change in the level of intelligence of 11 year olds; it found that there was no significant change in mean IQ and concluded "there has been no decline, but neither is there any evidence of a rise in average intelligence".[51] In a recent study of attitudes in grammar schools, teachers were asked to give their own opinion of any changes over time in the average intelligence of their pupils, and although some teachers claimed to have experienced an increase in the spread of intelligence, they considered the average level to be roughly constant.[52/] We have therefore made no allowance for any changes in the average intelligence of pupils since 1950.[53/]

Table 2. Imputed Value of Pupils' Time

		1950-1951	1963-1964
Money value	(£m)	30.2	223.5
Real terms		30.2	86.3
Index	1950 = 100	100	285

(iii) School Buildings

The standard method of valuing the input of capital equipment and buildings is by annual rental charges, but educational capital is not rented, so that once again a money value must be imputed, by estimating the annual cost which would be incurred if school buildings were rented, instead of being owned by local authorities. Any estimation of the rent which school buildings could command in an open market is rather arbitrary, but it does indicate an important "hidden cost". Rents for owner-occupied buildings are imputed for the calculation of National Income Accounts; imputed rent is calculated for most buildings in the public sector by using local authority loan charges. This was the method used for calculating the rent of educational buildings before 1964, but since 1964 imputed rent has been recalculated on the basis of the rateable values of educational buildings.[54/] Loan charges in this period have been consistently higher than the rateable values of school buildings, and in recent years they have also risen much faster. For instance, between 1955 and 1963, loan charges for all educational buildings rose from £27 million to £83 million, whereas rateable values only rose from £24 million to £58 million. This rapid increase in loan charges is partly due to increased investment in new school buildings but also partly due to rising interest rates. Unfortunately, there are no figures available for the rateable value of secondary school buildings alone, and figures are not available for the period before 1955, so it is impossible to base our estimate of imputed rent for school buildings on rateable values.

Loan charges for educational building as a whole rose from £9.7 million in 1950 to £82.9 million in 1963-1964. Before 1959 loan charges were not published separately for secondary and primary schools, but since that date the proportion attributable to secondary schools has remained constant at 52 per cent, so we have applied this proportion to the figures for the whole period, and estimate that loan charges for secondary school building rose from £5.0 million to £43.6 million.[55] This great increase in loan charges is partly due to the extent of new school building: during this period, 1.5 million new school places were completed. It also reflects fluctuations in the interest rates at which local authorities can borrow money, but in order to compare the value of school buildings in 1950 and 1963 we need to exclude such fluctuations.[56] An alternative approach using loan charges is to estimate the current replacement cost of school buildings and assume that the imputed rent of the capital is equal to its amortization at a steady rate of interest. The Robbins Committee estimated the value of the use of existing university buildings in this way by calculating current replacement costs and assuming an amortization rate of 6 per cent over

60 years.[57/] A similar calculation for secondary school buildings gives an estimate of imputed rent in 1950 of £20.0 million, and in 1963 of £50.0 million.

School buildings are not, of course, used entirely for educational purposes; some school buildings are used in the evening by Evening Institutes, the Youth Service or as play centres. A survey of primary schools in 1962 showed that 52 per cent of all primary schools were sometimes used for such purposes outside school hours;[58/] unfortunately, no information is available on the non-school use of secondary school buildings, but there is often some use of secondary school buildings in the evening. This means that there should be some slight adjustment to these figures, since a small part of the value of school buildings helps to produce non-educational output, but lack of more detailed information makes this impossible. It would, however, make only a small difference to the final calculation.

Building costs have risen since 1950, but due to increased efficiency in school building, the cost of a new school has risen less than building costs in general. In fact, during the early part of the period, the average cost of a new school place was actually falling.[59/] If we deflate these estimates by an index of average school building costs, this provides an estimate of the real value, excluding price changes, of the use of school capital.

Table 3. Imputed Value of School Capital

		1950-1951	1963-1964
Money value	(£m)	20.0	50.0
Real terms		20.0	44.0
Index	1950 = 100	100	220

(iv) Other Educational Goods and Services

The last main category of educational inputs includes the time of non-teaching staff, the use of books, stationery and other materials, equipment, fuel and light. All these inputs can be estimated by current expenditure, deflated by suitable price indicators. Expenditure on maintenance of school buildings, fuel and light, and on all non-teaching staff rose from £10.9 to £42.6 between 1950 and 1963. Expenditure on furniture and equipment rose from £3 million to £8.7 million; expenditure on books, stationery and other materials rose from £3 to £11.3 million. There is no index available of changes in the price of these specific goods and services, but indices are available showing changes in the price of all books and stationery, maintenance costs for householders, and domestic furniture.[60/] The prices of educational goods and services can be assumed to follow roughly the same trends, so these indices have been used to estimate the real change in these inputs.

Table 4. Educational Goods & Services

	1950-1951	1963-1964
Money Values (£m)		
Admin. Staff & Maintenance	10.8	46.4
Equipment	3.0	9.9
Books	3.0	11.7
Real Terms		
Admin. Staff & Maintenance	10.8	26.1
Equipment	3.0	7.0
Books	3.0	6.1
Index 1950 = 100		
Admin. Staff & Maintenance	100	241
Equipment	100	233
Books	100	203

(v) The Relationship between Output and Inputs

Chart 4 shows the year-by-year increase in total inputs, measured in real terms, since 1950. Between 1950-1951 and 1963-1964 the input of all factors increased by 135 per cent, that is to say inputs more than doubled. The greatest increase has been in the value of students' time, which rose by 185 per cent, due to the increasing number of children staying on at school after fifteen. But all other input factors, the time of teachers and the use of materials, equipment and buildings also rose by more than 100 per cent. This rate of increase is far greater than the increase in the number of children at school: inputs per pupil rose by 42 per cent between 1950 and 1963.

If the index of total inputs is compared with the various indices of output, we arrive at measures of total-factor-productivity for secondary education. If we simply relate the increase to the numbers of school-leavers, the unweighted output index, the ratio of output to inputs has declined by 45 per cent since 1950. If we weight school-leavers by the length of their schooling, output per unit of input declined by 41 per cent, and if output is weighted by the "economic" weights, the ratio declined by 38 per cent.

Owing to lack of data, it is not possible to calculate an index of productivity based on the "academic" weighting for the entire period since 1950, but if we look at the period 1953-1963 for which figures are available, the unweighted index fell by 40 per cent, the "length of schooling" index by 36 per cent, the "economic" index by 33 per cent, and the "academic" index by 20 per cent. Thus, every allowance for increases in the quality of school-leavers reduces the decline in productivity, but the trend is persistently downward. In no case did quality rise as fast as the input of resources. This means that productivity declined at an average rate of over 2 per cent a year between 1950 and 1963.

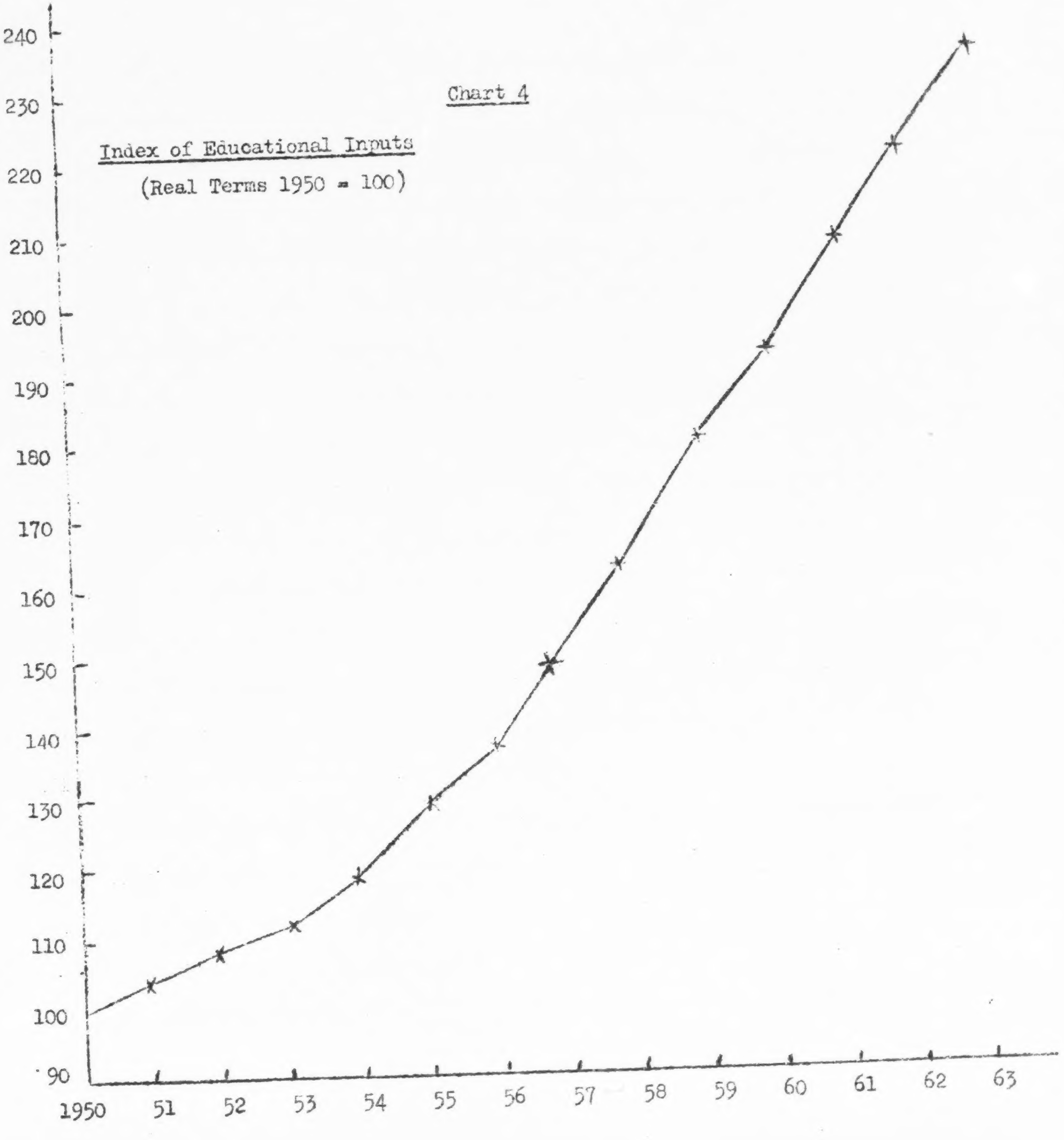
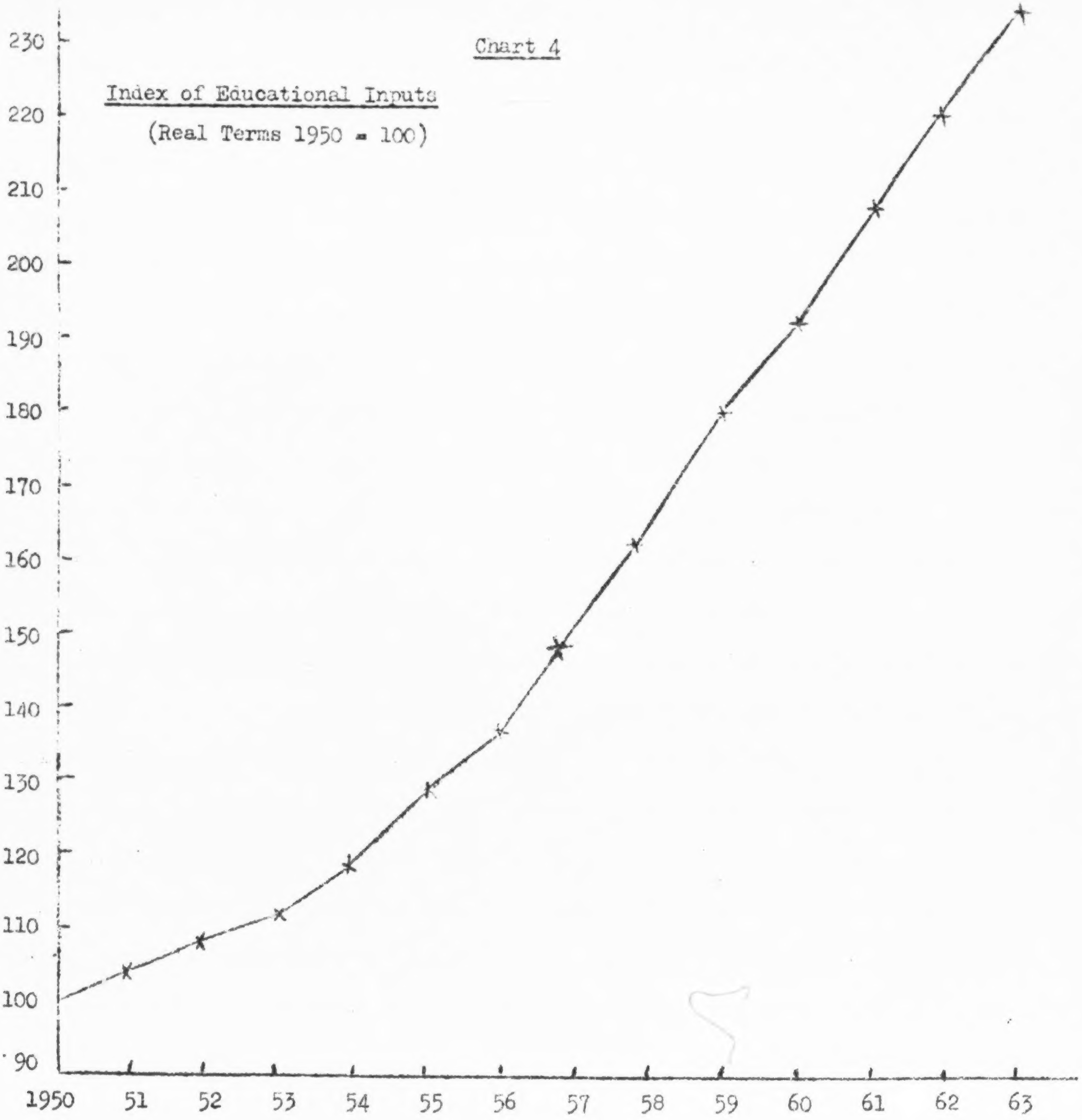


Chart 4
Index of Educational Inputs
(Real Terms 1950 = 100)
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
1950
51
52
53
54
55
56
57
58
59
60
61
62
63

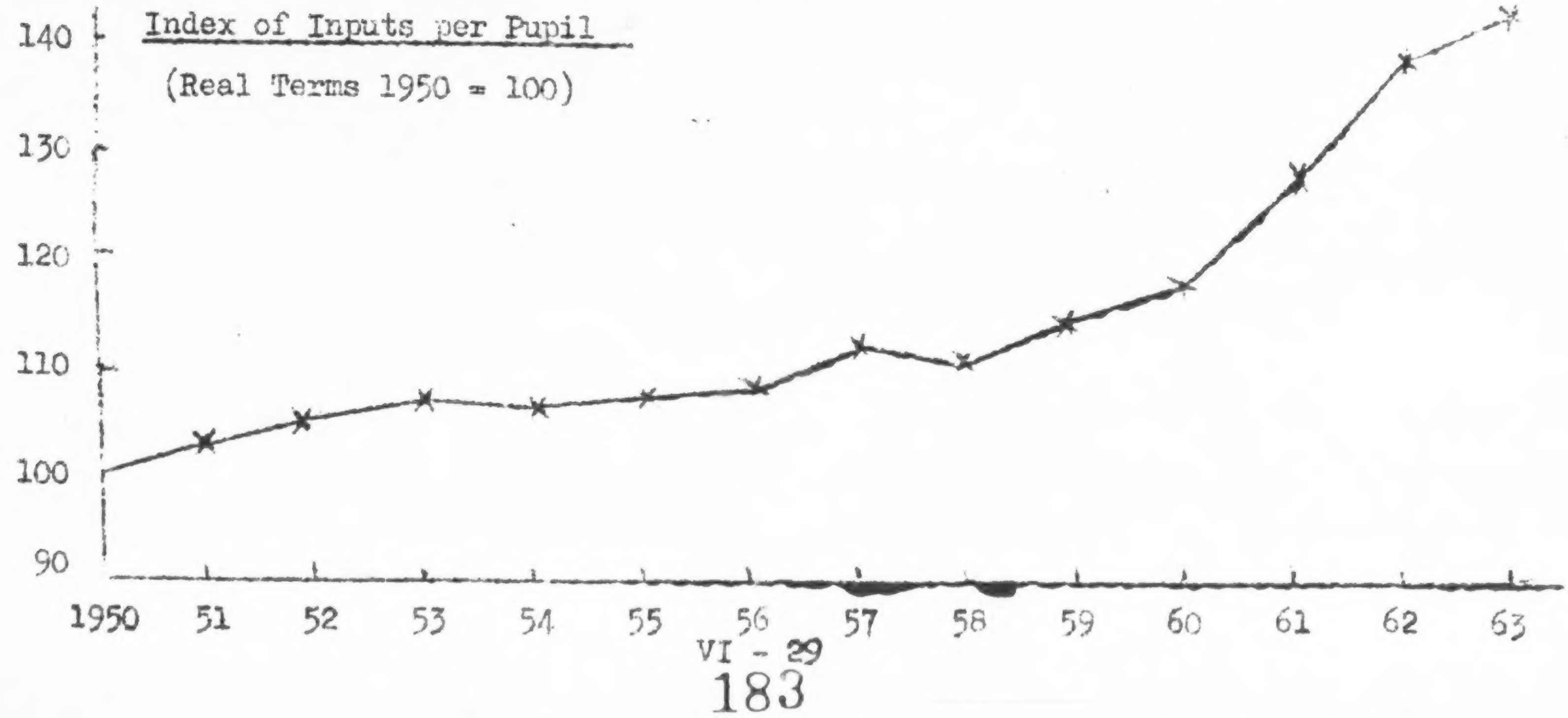
Chart 4



Index of Educational Inputs

(Real Terms 1950 = 100)

Chart 5



Index of Inputs per Pupil

(Real Terms 1950 = 100)

It is, however, slightly misleading simply to relate the output of one year to the inputs in the same year, since the "period of production" in secondary schools is long and variable. Pupils stay at school from four to eight years, so that the inputs in one year are contributing to the output several years ahead; and school-leavers in any one year have consumed inputs during the previous four to eight years. Since the trend of inputs is constantly rising the inputs directly related to a particular year's output will be lower than total inputs in that year. We have, therefore, recalculated the figures by relating the output of school-leavers of different ages to inputs in the previous four to eight years. Thus the output of sixteen-year old leavers in 1963, for instance, is related to a proportion of total inputs in each of the previous five years, the whole of their secondary school life. We have assumed that in one year each age-cohort consumes inputs according to the proportion the cohort constituted of the total secondary school population. This assumption is in fact incorrect, because older pupils on average consume more inputs than those below the school-leaving age, but apart from this fact we have no information about the relative costs of educating pupils of different ages. It is, therefore, impossible to relate the output of one age-cohort to a realistic estimate of the inputs those pupils actually consumed. This method of calculation slightly underestimates the actual inputs consumed by each years' output, whereas the previous method produced a slight over-estimate. However, even this imperfect adjustment illustrates the importance of making some allowance for this problem.

Between 1950 and 1963 total inputs rose by 135 per cent, and the productivity indices based simply on total inputs fell at rates between 38 and 45 per cent, according to the output weights adopted. However, if inputs for 1963-1964 are recalculated on a cohort-basis the decline in productivity is reduced: the unweighted index now falls by 39 per cent, the 39 per cent, the "length-of-schooling" index by 35 per cent, and the "economic" index by 32 per cent.

The increase in total inputs has been particularly fast during the 1960s, and during these years the factor increasing most rapidly was pupils' time. There was a sudden increase in 1960-1961 in the value of pupils' time, but this increase was in some ways artificial. Children born immediately after the war in the population "bulge" reached their fifteenth birthday in that year, and thus the value of pupils' time was suddenly inflated. If the value of the time of pupils below the age of fifteen had been included in the input index the increase would have been more gradual. We have therefore calculated a second index of inputs which excludes pupils' time to avoid the problem of inflating total inputs because of the population bulge. If output is related simply to inputs of teachers, materials, equipment and capital, the unweighted productivity index between 1950 and 1963 declined by 40 per cent, the "length-of-schooling" index by 35 per cent, and the "economic" index by 33 per cent.

Table 5 summarizes our findings.[61/] Each adjustment that was made reduced the decline in productivity, but whatever adjustments are made the index reveals a downward trend; there may be some inaccuracies in our index of inputs because of lack of data, but whenever there was a range of alternatives we took the lower estimate, to minimize a fall in productivity. Yet, after all adjustments, there remains a residual fall in productivity between 1950 and 1963 of over 1 per cent per annum. Every year more resources are needed to educate each school child. What does this mean for educational policy? The final section of this paper examines some of the policy implications of our findings.

Table 5. Rates of Change in Productivity Ratio

Index based on Total Inputs	Total Decline in Productivity 1950-1963 %	Average Annual Decline 1950-1963 %
Unweighted Output Index	-45	-2.9
"Length-of-Schooling" Index	-41	-2.7
"Economic" Index	-38	-2.5

	Total Decline in Productivity 1953-1963	Average Annual Decline 1953-1963
Unweighted Index	-40	-3.4
"Length-of-Schooling" Index	-36	-3.1
"Economic" Index	-33	-2.9
"Academic" Index	-20	-1.8

Index based on "cohort" calculation

	Total Decline 1950-1963	Average Annual Decline 1950-1963
Unweighted Index	-39	-2.5
"Length-of-Schooling" Index	-35	-2.3
"Economic" Index	-32	-2.1

	Total Decline 1953-1963	Average Annual Decline 1953-1963
Unweighted Index	-33	-2.9
"Length-of-Schooling" Index	-29	-2.6
"Economic" Index	-26	-2.3
"Academic" Index	-14	-1.3

Index excluding Pupil Time

	Total Decline 1950-1963	Average Annual Decline 1950-1963
Unweighted Index	-40	-2.6
"Length-of-Schooling" Index	-36	-2.4
"Economic" Index	-33	-2.2

	Total Decline 1953-1963	Average Annual Decline 1953-1963
Unweighted Index	-35	-3.0
"Length-of-Schooling" Index	-31	-2.7
"Economic" Index	-28	-2.5
"Academic" Index	-12	-1.1

(vi) Implications for Policy

If our index adequately measures the output and quality of secondary education the productivity of education is declining, whereas the productivity of most other sectors of the economy is rising. This means that education is becoming increasingly costly relative to other goods and services. As schools have to compete with other sectors of the economy for resources, they will find it increasingly expensive even to maintain present standards and doubly difficult to raise standards or expand provision. Yet this is what schools are expected to do. The trend for more children to stay in school after the minimum age, the raising of the school-leaving age, the desire for smaller classes and the demand for higher standards of education for the below-average child, all increase the pressures on already scarce resources, not to mention the increased needs of other branches of the educational system - demands for more nursery schools, and remedial teaching, expansion of higher and further education, or special provision for children from "priority areas" or deprived homes. If schools also have to face inevitably rising costs as a result of falling productivity it will only be possible to achieve such reforms by drastically increasing the proportion of national income devoted to education; this in turn demands either increased taxation or substantial cuts in other government expenditure. Both seem politically unlikely at the moment. It would seem imperative, therefore, that schools should be experimenting with alternative ways of using their human and physical resources in the attempt to raise productivity, so that enough time or money could be saved to achieve these long-term goals. It is sometimes suggested that improvements in the productivity of education are impossible because the process of education is necessarily labour-intensive and the possibilities of technical change very limited. However, in the past few years the development of technical aids for authorities found substantial variations in the cost per pupil in different areas, but instead of relating these differences to measures of output or quality, the authors comment that "To scrutinize 'what authorities got for their money' and to relate the schooling expenses to any measurement of the results obtained would smack of practices heartily and justly condemned in the past".64/

Detailed studies of productivity at the national or the individual school level would require some recasting of present methods of collecting and presenting statistics. Assumptions had to be made at almost every stage of this study because of lack of data. For instance, estimates of the value of school buildings are inadequate, and no attempt is made to estimate separately the value of primary and secondary schools or further education establishments. Official statistics show what schools spend on teachers' salaries and on other salaries; but whether the "other salaries" are primarily for administrative or maintenance staff, or for unqualified teachers' assistants, it is impossible to say without close scrutiny of individual LEA accounts; yet "other salaries" was one of the fastest growing input-factors since 1950. Price indices are calculated for most categories of consumer expenditure and raw materials by the Central Statistical Office, but there are no official price indices for education. There is very little information available on the relative costs of different types of schooling; for instance, it is well known that grammar schools are more costly than secondary modern schools. Vaizey estimated that the average grammar school child received 170 per cent more per year in terms of resources than the average modern school child.65/ But official statistics give no information on this point. All these shortages of information increase the problems of measuring productivity.

But the most important and still unsolved difficulty is that of finding adequate measures of quality. The obvious implication of this study is that it is still impossible to measure productivity adequately without better measures of output and quality. Educators are unlikely to increase the effectiveness of what they do without good measures of educational outcomes. This requires the co-operation of educational psychologists, administrators and practising teachers. At the moment guesses and impressions about changing standards of education abound, but concrete evidence is lacking. For example, we cannot measure with any accuracy the effect of World War II on educational standards: "It would appear that national performance in most subjects tended to rise between the wars ... then during World War II there was a serious loss of 1 to 2 years of Education Age, probably differing according to the impact of war conditions in different parts of the country. Changing conceptions of the importance of formal subjects may also have affected standards. They seem to be rising again now, but the overall picture can only be described as chaotic".[66/]

Writers have been emphasizing the need for better measures of educational quality for many years. In 1943 Ridley and Simon, reviewing the various criteria used to evaluate local government activities, pointed to the lack of adequate yardsticks for education.[67/] Twenty years later, an American educator wrote "we cannot describe how close our schools come to accomplishing what they aim to accomplish, identify in any precise way the strengths and weaknesses of the system, or measure progress or the lack of it over time";[68/] and an English economist pointed out that "we do not have good measures of the output of the educational system, and are unable to assess satisfactorily either the quantity or the quality of the product of the system. It is at this point that future research be concentrated".[69/] This theme has been constantly reiterated but education remains one of the few activities which lacks any real measures of success.

In the absence of output measures, success is usually measured simply in terms of 'what is put in' rather than 'what is achieved'; it is assumed that every increase in inputs automatically results in higher quality education, but this assumption is rarely put to the test. For instance, it is widely believed that smaller classes mean a better standard of education, although a considerable body of research both in America and Britain suggests that class size alone has relatively little influence on pupil achievement.[70/] Yet, the notion that increasing the input of teachers will necessarily raise the quality of output is thought too self-evident to require proof.

Unfortunately, it is simply not true that quality can be measured by 'what is put in'. In the field of school-building, for example, increased efficiency since the war has allowed standards to be maintained while costs have been reduced. During the early 1950s the average cost of new school buildings actually fell, and although costs later started to rise again school building costs have risen much less than general building costs. The Ministry of Education commented: "To those who say that these are not really economies producing better value for money but are cuts in expenditure which mean the sacrificing of standards, we must reply that the amount of money spent has rarely been a true indication of the value obtained. Many of the best schools built since the war have been the cheapest".[71/] But if this is true of buildings, it is just as true of other inputs; the input of resources is not itself a measure of quality. What little research has been attempted suggests that if quality is measured independently, there is certainly a positive relationship between cost and the quality of output, but the correlation is far from perfect. The New York Quality Measurement Project, which related pupil achievement in standardized tests to costs per pupil, found that there is "an abiding relationship between expenditure and system effectiveness or quality ... but the size of the correlations suggest that the educational benefits of additional funds are not automatic".[72]

This problem of the relationship between increased expenditure and quality needs much more investigation. Questions that need to be answered include:

(a) Which has the greatest effect on children's educational achievement, the average size of class or the qualifications of teachers?

(b) What are the possibilities of substituting capital for labour in the school, for example, by increased use of educational television, combined with more flexible groupings of children?

(c) Do economies of scale operate in schools, and if so what is the optimum size of school?

(d) Is the present arrangement of the school year, with its concentration of holiday in the summer, the most effective use of available time?

These and countless similar questions are being studied in individual schools and the Nuffield project on "Resources for Learning" will throw some light on the effects of alternative ways of allocating resources. But all such research is hampered by the difficulties of measuring output without some national system of standardized testing, and by the hidden assumption of most educators that every increase in inputs necessarily raises the quality of outputs.

Conclusions

This study has shown that the inputs required to produce one school-leaver have risen steadily since 1950; there have, at the same time, been a number of increases in the quality of education provided in secondary schools, whether measured in terms of the lengthening of school life, examination results or enhanced lifetime earnings prospects, but none of these improvements in quality matches the increased costs of education. This means that, on our definitions, productivity has declined between 1950 and 1963 at a rate of 1 to 2 per cent a year. This is in direct contrast to the performance of other sectors of the economy: the productivity of manufacturing and service industries has risen by 1 or 2 per cent a year during the period 1948 to 1963.[73]

Some of this apparent decline in productivity could doubtless be explained by other improvements in the quality of education which have not so far been measured. But unless research is focused on isolating and measuring these changes in quality, the educational system will continue to absorb more and more resources without providing evidence that they are being used effectively. No country, even a developed country like Britain, can afford this indefinitely. Our research does not prove that schools waste resources but it does show that much better methods of analysing and evaluating expenditure are needed if we are to be certain that no waste occurs.

Education is not unique in lacking such measures of productivity. The productivity of other social services such as health or welfare has also been neglected in the past and, like educational productivity, has almost certainly failed to match the increases in productivity achieved by other sectors of the economy. Economists have recently studied the problems of measuring the productivity of other service industries, including health[74] and even the performing arts.[75] All social services, including education, share important characteristics: they do not operate for profit, they are relatively labour-intensive, the possibilities of technical change are more limited than in industries producing manufactured goods, and it is difficult to define and measure the services they provide. This frequently means that the relationship between inputs and outputs is ignored because of the problems it would raise. Yet it is non profit-making industries that have the greatest need for studies of productivity. Paradoxically, the industries most concerned with measuring and improving productivity are the profit-making industries which already have a convenient and readily observable yardstick of efficiency in the form of profits.

It is this absence of concern about price or profit which probably explains the persistent neglect of productivity studies in all the social services, particularly education, and this in turn may partly explain the tendency for productivity to fall and costs to rise. Those educational or training institutions that do operate for profit, such as private secretarial colleges, do have readily measurable indicators of output, such as tests of typing and shorthand skills, that can be related to costs or to the input of teachers' time. But most schools or hospitals do not operate for profit and are consequently less concerned about cost-effectiveness.[76] In education the situation is made even worse by the dangerous assumption that output can only be measured by what is put in; thus every increase in inputs is positively welcomed as proof of rising quality. In such circumstances it is not surprising that costs rise as more and more resources are poured into the schools.

The solution is not to run schools for profit but for education to adopt the same concern about productivity that is found in other industries. A recent article stated that "one way to start an argument among educationists is to mention the productivity of teachers".[77] The main purpose of this article is to provoke such an argument in the hope of increasing "productivity-mindedness" in education.

Maureen Woodhall
Mark Blaug

University of London
Institute of Education

Footnotes

1. The research was supported by a grant from the Department of Education and Science and is part of a continuing study of educational productivity at all levels. For an attempt to apply similar methods to university education, see M. Woodhall and M. Blaug, "Productivity Trends in British University Education, 1938-1962", *Minerva*, Summer 1965 (Vol. III No. 4) pp. 483-98, and the comments by Professor H.G. Johnson and Professor R. Stone, together with our reply, *ibid*., Autumn 1965 (Vol. III, No. 5) pp. 95-105. We are indebted to a number of people for comments on an earlier draft of this paper, particularly P.R.G. Layard and H. Glennerster. Miss A. Mott has assisted with the calculations and made a number of valuable comments on the paper as a whole.

2. However, a fall in productivity need not necessarily imply inefficiency; it may simply mean that opportunities for technical progress have been exhausted. For further discussion of this point, see our comments in *Minerva*, Autumn 1965, pp. 111-2.

3. H.F. Clark, *Cost and Quality in Public Education* (Syracuse, N.Y.: Syracuse University Press, 1963), p. 11.

4. For an interesting discussion of this clash, see C.E. Beeby, *The Quality of Education in Developing Countries* (Cambridge, Mass.: Harvard University Press, 1966), ch. 2.

5. W.A.L. Blyth, *English Primary Education: A Sociological Description*, Vol. II (London: Routledge and Kegan Paul, 1965), p. 124.

6. For a critical account of this movement, see R.E. Callahan, *Education and the Cult of Efficiency* (Chicago: University Press, 1962).

7. See P.E. Vernon, *Intelligence and Attainment Tests*. (London: University of London Press, 1960).

8. *Project Talent. The Identification, Development, and Utilization of Human Talents* (Pittsburg: Project Talent Office. Pittsburgh University 1960-1964). For a brief review of the major findings to date, see J.T. Dailey, "Education and Emergence from Poverty", *Journal of Marriage and the Family*, November, 1964, pp. 430-34. A wealth of information on the test-scores of samples of American secondary school pupils was also produced in a recent survey concerned with equality of educational opportunity in the US. The achievement of children of different races was correlated with a wide range of school and socio-economic factors, in order to discover the extent and effects of racial segregation in education. See J.S. Coleman, *et al, Equality of Educational Opportunity*. (Washington (Washington D.C.: Government Printing Office, 1966).

9. S.M. Goodman, The Assessment of School Quality: First Report of Quality Measurement Project (Albany, N.Y.: University of New York, State Education Department, 1959).

10. P.E. Vernon, "Educational Attainments in England and Scotland", British Journal of Educational Psychology, Vol. 25, 1955, pp. 195-203.

11. D.E.M. Gardner, Testing Results in the Infant School (London: Methuen, 1942) and Long Term Results of Infant School Methods (London: Methuen, 1950).

12. R. Lynn, "The Relation between Educational Achievement and School Size", British Journal of Sociology, Vol. 10, No. 2, 1959, pp. 129-136.

13. L.C.D. Kemp, "Environmental and other Characteristics Determining Attainments in Primary Schools", British Journal of Educational Psychology, Vol. 25, 1955, pp. 67-77.

14. For a description of these studies, together with a useful survey of research into the influence of school and environmental factors on educational achievements, see S. Wiseman, Education and Environment (Manchester: University Press, 1964).

15. Ibid., pp. 128, 152. The average test-scores of all children in the samples rose by 3 percentage points in reading and 4 percentage points in arithmetic between 1951 and 1957.

16. Department of Education and Science, Progress in Reading. Education Pamphlet No. 50 (London: H.M.S.O. 1966). This summarizes the results of earlier surveys, including one carried out for the Newson Committee, and the recent survey carried out for the Plowden Committee. These surveys showed and increase in terms of average reading age between 1948 and 1964 of 17 months for 11 year olds and 20 months for 15 year olds.

17. T. Husen (editor), International Study of Achievement in Mathematics. (New York: John Wiley, 1967). See also D.A. Pidgeon (ed.), Achievement in Mathematics: A National Study of Secondary Schools. (Slough: National Foundation for Educational Research, 1967) for an analysis of the British results.

18. As Wiseman suggests: "As measures of the educational attainment of boys and girls at the end of their secondary school, tests of reading and mechanical arithmetic are far too limited in scope to give us a satisfactory picture... For some pupils measured ability in our test papers may be negatively correlated with attainment in the wider and more sophisticated subjects of their fourth- and fifth-form courses ... in one sense, these two groups of subjects are in competition with each other", op. cit., pp. 148-9. E. Fraser remarks that: "It has been shown that boys in a junior secondary school score higher marks in an arithmetic test than boys of the same age in a senior secondary school although the latter are much more intelligent. The reason is simply that the senior secondary boys spend much less time on arithmetic and instead devote the time to latin, greek, geometry and other subjects which do not appear in the curriculum of the junior secondary boys", Home Environment and the School (London: University of London Press, 1959), p. 11.

19. UNESCO Institute,for Education, Hamburg, Educational Achievements of 13-Year-Olds in 12 Countries. Results of an International Research Project 1959-1961 (Hamburg: UNESCO Institute for Education, 1962).

20. See, for instance, R.H. Lindeman, Educational Measurement (Glenview, Ill.: Scott Foresman and Co., 1967) or R.L. Ebel, Measuring Educational Achievement (Engelwood Cliffs, N.J.: Prentice Hall, 1965).

21. See, for instance, J.W. Getzels and P.W. Jackson, Creativity and Intelligence (New York: John Wiley, 1962); T.G.W. Miller, Values in the Comprehensive School (Birmingham University Press, 1961).

22. See A. Little, J. Westergaard, "The Trend of Class Differentials in Educational Opportunity in England and Wales", British Journal of Sociology, December 1964, pp. 301-17; and Report of the Committee on Higher Education, (Robbins Report) Appendix II(B); (London, H.M.S.O., 1963. Cmnd. 2154). "There was little change between 1928-47 and 1961 in the proportions of students coming from working class backgrounds, inspite of the fact that the number of students at university had more then doubled during this period". P. 4.

23 The main sources of statistics for the following calculations are: (1) The Annual Reports of the Ministry of Education; (2) Ministry of Education, Statistics of Education: this series of statistics, published annually since 1961 provides greater detail than the statistics previously published in the Ministry's Annual Reports; and (3) Institute of Municipal Treasurers and Accountants, Education Statistics. Because of the lack of suitable statistics before 1950, we have not attempted a historical analysis which is directly comparable to our study of productivity trends in British university education, 1938-1962.

24. B.A. Weisbrod, External Benefits of Public Education: An Economic Analysis (Princeton, N.E.: Industrial Relations Section, Princeton University, 1964), pp.19-23.

25. This data was collected in a sample survey conducted by Dr. Mark Abrams, Head of Research Services Ltd. See M. Abrams, "Rewards of Education", New Society, 9 July, 1964, p. 26, and M. Woodhall, "It is Worth Educating Women", New Society, 19 August, 1965, p. 21.

26. Of course, education is only one of the factors that influence life-time earnings; social class background and natural ability also help to determine an individual's occupation and earnings. For a full discussion of the relationship between earnings and education in Great Britain, see M. Blaug, "The Rate of Return on Investment in Education in Great Britain", Manchester School, September 1965, pp. 205-261.

27. I. Lorge, "Schooling Makes a Difference", Teachers College Record, Vo. 46, 1945; P.E. Vernon, "Changes in Abilities from 14-20 years", Advancement of Science, Vol. 5, 1948, p. 138; T. Husén, "Influence of Schooling on IQ", Theoria, Vol. VII, pp. 61-88, 1951.

28. C.A. Anderson, M.J. Bowman, "Theoretical Considerations in Educational Planning", *Educational Planning*, ed. Don Adams (Syracuse, N.Y.: Syracuse University Press, 1964), p. 12.

29. Ministry of Education, *The General Certificate of Education* (London: H.M.S.O., 1953), p. 3.

30. "Though the G.C.E. qualifications of entrants to higher education have risen, there is no guarantee that G.C.E. standards have remained constant from year to year" (*Robbins Report, op.cit.*, Appendix I, p. 84). The whole question of variations in standards of marking examinations is very confused. A classic study of the variability of examiners' markings in the 1930s questioned the reliability of the essay-type examintions; P. Hartog and E.C. Rhodes, *An Examination of Examinations* (London: Macmillan & Co. 1935) However, others have used the same evidence to emphasize the validity of such examinations. P.E. Vernon, for instance, writes "Hartog and Rhodes doubtless desired to shock the public conscience with regard to examinations, and so did their best to emphasize the disagreements. The present writer is more impressed by the smallness than by the largeness of the discrepancies, and would conclude from his study of the results that important public examinations, like the School Certificate and University honours are marked much more consistently than is usually the case": *The Measurement of Abilities* (London: University of London Press, 2nd Ed., 1956), p. 204.

31. *Times Educational Supplement*, 7 May 1965.

32. *Where*, March, 1966, p. 7.

33. Ministry of Education, *Secondary School Examinations Other Than G.C.E.* (London: H.M.S.O., 1960), p. 23.

34. For an account of the aims of the Certificate of Secondary Education, and an outline of some of the new techniques of examining, see Secondary School Examinations Council, *Seventh Report*: *Scope and Standards of the Certificate* of Secondary Education (London: H.M.S.O., 1963) and *Examinations Bulletins* (London: H.M.S.O., 1963-1966).

35. For a full description of the weighting system and calculations, see Appendix I.

36. The values of the indices for each year since 1950 are given in Appendix II.

37. The results of the reading surveys were actually given in terms of standardized scores, but these can be converted to "reading-ages"; between 1948 and 1961 the average reading-age of 15 year-olds increased by 20 months. This gain in months of reading-age can then be expressed as a percentage of the preceding school life to give an approximate rate of increase in the "pace of learning". Allowing for the standard error of the mean scores, this calculation gives a final estimate between 14 and 24 per cent. See *Progress in Reading*, op.cit., p. 18.

38. For a defence of the principle of calculating opportunity costs in education, see M.J. Bowman, "The Costing of Human Resource Development", The^ Economics of Education. Proceedings of a Costing of Human Resource Development", The Economics of Education. Proceedings of a Conference held by the International Economic Association, eds. E.A. Robinson, J. Vaizey (London: Macmillan, 1965), pp. 349-379.

39. For a full discussion of the distinction between pure educational expenditure and non-educational expenditure by schools or local authorities, see A. Peacock, H. Glennerster and R. Lavers, The Finance of Education in the United Kingdom (forthcoming, 1967).

40. These figures are derived from Institute of Municipal Treasurers and Accountants, Education Statistics; the figures were obtained from the average expenditure of all LEA's, multiplied by the total number in school. These figures are slightly higher than those published by the Department of Education and Science, as they include superannuation contributions, which are excluded from the DES figures.

41. The justification for assuming that age and qualifications reflect teacher quality is twofold: on economic grounds, older teachers are more valuable than younger teachers, and graduates more valuable than non-graduates, because they command salary differentials which reflect their relative scarcities; on educational grounds, a number of research studies have shown that pupil achievement is often correlated with the length of experience, qualifications and salary-level of teachers. See A.S. Barr, et all., "The Measurement of Teaching Ability" Journal of Experimental Education, September, 1945, pp. 1-100, and A.S. Barr et al., "Wisconsin Studies of the Measurement and Prediction of Teacher Effectiveness", ibid., September, 1961, pp. 1-156. Before 1956 there were separate salary scales for men and women, but between 1956 and 1961 women teachers were given successive "equal pay increments" to bring them into line with men. We have not assumed that sex-related salary differentials before 1956 reflect quality differences, and the index of salary rates is therefore based on men's scales only.

42. There is, of course, no unique index of teachers' salaries; the values of any price index depend on the weighting system adopted. The effects of adopting different weighyd when calculating indices of teachers' salaries were examined by F. Conway, "An Index of Teachers' Salaries", Bulletin of the Oxford University Institute of Statistics, June, 1953, pp. 237-54; "School Teachers' Salaries 1945-1959", Manchester School, May, 1962, pp. 153-180; and "Salary Indices for School Teachers", Manchester School, January 1967, p.. 69-81. The index used in this calculation measures changes in the basic salary scale for both graduate and non-graduate teachers. The point midway between the maximum and minimum basic salary was calculated for graduates and non-graduates each year, using data in the Reports of the Burnham Committee on Scales of Salaries for Teachers in Primary and Secondary Schools. (London: H.M.S.O.). The final index is a weighted average of the graduate and non-graduate indices thus calculated. The weights used were the proportions of graduate and non-graduate staff in all maintained secondary schools, which have remained fairly constant since 1950 at 38 and 62 per cent.

43. See A.S. Barr, *et al.*, *op.cit.*, and B.J. Biddle, W.J. Ellena, *Contemporary Research on Teacher Effectiveness*. (New York: Holt, Rinehart and Winston, 1964.)

44. Some economists have argued against the inclusion of foregone earnings on the grounds that "if you throw all secondary students into the labour market the wages of youth would decline and there would be much unemployment"; this argument is neatly demolished by M.J. Bowman in "The New Economics of Education", *International Journal of the Educational Sciences*, Vol. I, No. 1, p. 38; she points out that "if you threw all secondary pupils into the job market there would be many unemployed teachers and those who found jobs would have to take lower pay", yet this does not justify excluding teachers' salaries from cost calculations.

45. See Ministry of Education, *15 to 18: A Report of the Central Advisory Council for Education* (London: H.M.S.O., 1959), pp. 57-58.

46. *Robbins Report*, *op.cit.*, Appendix IV, p. 152-3.

47. Average weekly earnings of juveniles in all industries are published each year in the *Ministry of Labour Gazette*. The estimated earnings for each age group, which formed the basis for this calculation, are given in Appendix III.

48. It could be argued that even the time of 11-14 year-olds does have an opportunity cost; children of this age do work in other countries, and it would be possible to make some notional estimate of the value of younger children's time by extrapolating backward the earnings of 15 to 18 year-olds. However, even if there were no minimum school leaving age, the amount of productive work which could be adequately performed by young children is limited in a modern, developed economy that such an exercise would have little meaning. "People in low income countries ... expect children to enter upon useful regular work, say, at age 10; as countries rise on the income scale, the age at which children are expected to take jobs also rises", T.W. Schultz, The Economic Value of Education" (New York: Columbia University Press, 1963), p.31.

49. We used the index published annually in the Ministry of Labour Gazette. See *Ministry of Labour Gazette*, January, 1957 (London: H.M.S.O.), p. 57ff.

50. Although earnings foregone ought to be included in an estimate of the total input of resources in the educational system, it could be argued that the output of schools should be related only to those inputs over which the school or education authority exercise control, especially in view of the fact that the value of pupils' time depends on the age structure of secondary school pupils, and is thus particularly sensitive to variations in the birth rate. We have therefore calculated an index of inputs which excludes earnings foregone, and the calculations based on this index are given in Appendix IV. The effect of this is to alter the actual values of the final productivity index but it does not alter the general trends, as we show below.

51. J. Maxwell, The Level and Trend of National Intelligence: The Contribution of the Scottish Mental Surveys (London: University of London Press, 1961), p. 24. One problem when comparing the test performance of different generations is the increased experience of successive generations to tests. C.A. Burt, reviewing this book (British Journal of Educational Psychology, Vol. XX, No. 1, pp. 55-61) discussed the effects of familiarity with intelligence tests, a point also discussed by Vernon, op.cit.

52. See F. Stevens, The Living Tradition: The Social and Educational Assumptions of the Grammar School (London: Hutchinsons, 1960), p. 83.

53. Nor have we made allowance for any change in the quality of primary school output. The problems of defining and measuring the output of primary schools will be discussed in a later paper; meanwhile, there is no available information on the quality of primary school-leavers apart from data on the reading ability of 11 year-olds which was discussed above.

54. See Central Statistical Office, National Income Statistics: Sources and Methods (London: H.M.S.O., 1956), p. 335, and National Income and Expenditure, 1964 (London, H.M.S.O., 1965), pp. 46 and 98.

55. The figure for 1950 is probably an overestimate, since more than half of all new school building in the early 1950's was for primary schools; however, these estimates are not used in the following calculations.

56. The amount of loan charges is also determined by the fluctuating proportion of capital expenditure which is financed from current revenue instead of borrowing. For a brief history of local authority practice in this regard, see J. M. Drummond, The Finance of Local Government (London: George Allen & Unwin, 2nd ed., 1962), pp. 122-128.

57. Robbins Report, Appendix IV, op.cit., p. 152. The Department of Education and Science, School Building Survey, 1962 (London: H.M.S.O., 1965) showed that 22 per cent of secondary schools were using buildings over sixty years old; however, sixty years is probably a good estimate of the average life of secondary school buildings. Primary school buildings tend to be older; in 1962 over 50 per cent of all primary schools were using buildings over sixty years old.

58. See Ministry of Education Pamphlet No. 33, The Story of Post-War School Building (London: H.M.S.O., 1957), pp. 59-64.

59. National Union of Teachers, The State of our Schools: Report of the National Survey of School Conditions (London: N.U.T., 1962), Part 1, p. 12.

60. The indices were all obtained from National Income and Expenditure, op.cit.

61. Year by year values of the alternative indices of productivity are given in Appendix IV, together with details on the method of calculation.

62. J. Vaizey, Education for Tomorrow (Penguin Books, 1966), pp. 38-9.

63. F. Edding, "Expenditure on Education: Statistics and Comments", The Economics of Education, op.cit., p. 65.

64. West Midland Group, Local Government and Central Control (London: Routledge and Kegan Paul, 1956).

65. J. Vaizey, The Costs of Education (London: George Allen & Unwin, 1958), p. 102. A considerable proportion of total inputs is accounted for by teachers' time. A recent survey collected information on per-pupil expenditures on teachers' salaries in samples of secondary schools of all types. This showed considerable variation: per-pupil expenditure varied from £55 in modern schools to £83 in grammar schools, with technical and comprehensive schools falling in between; this reflects the differences in the quality of teachers in different types of school, as reflected by age and qualifications. See D.A. Pidgeon, op.cit., pp. 31-42.

66. P.E. Vernon, Intelligence and Attainment Tests, op.cit., p. 116.

67. C.E. Ridley, M.A. Simon, Measuring Municipal Activities: A Survey of Suggested Criteria for Appraising Administration (Chicago: International City Managers' Association, 2nd edition, 1943).

68. "The Gross Educational Product: How Much Are Students Learning?", Carnegie Quarterly, Vol. XIV, No. 2, Spring, 1966, pp. 1-4. See also R.W. Tyler, "A Programme of National Assessment", Educational Forum, May, 1966, pp. 391-6.

69. M. Peston, "The Educational Needs of the Country: Manpower and Resources 1968-80", BBC, Educational Television and Radio in Britain (London: BBC, 1966), p. 19.

70. See, for instance, S.E. Harris: "Over the years we have had hundreds of experiments testing the effectiveness of teaching in small and large classes. Despite the fact that in the vast majority of instances these tests show either that the advantage (as shown by tests) lies with the large class that there is no significant difference, the folklore of the small class still persists", Higher Education: Resources and Finance (New York: McGraw Hill, 1962), p. 530. A. Yates noted: "Contrary to what is generally assumed, pupils taught in small classes do not manifest rates of progress or levels of attainment significantly different from those of children in large classes. That a reduction in the size of classes would produce an improvement in the achievements of the children concerned is regarded as self-evident by most teachers. The children themselves clearly do not agree that this is so", Grouping in Education (New York and London: John Wiley, 1966), p. 85. See also Children and their Primary Schools (The Plowden Report), Vol. I, (London, H.M.S.O., 1967), pp. 279-82.

71. Ministry of Education, The Story of Post-War School Building, op.cit., p. 57.

72. S.M. Goodman, The New York Quality Measurement Project, op.cit.

73. See C.H. Feinstein, "Production and Productivity in the U.K., 1920-62", *London and Cambridge Economic Bulletin*, No. 48 (December, 1963), pp. xii-xiv; and R.M. Deakin and K.D. George, "Productivity Trends in the Service Industries 1948-63", ibid., No. 53 (March, 1965), pp. xvi-xx.

74. S. Harris, *The Economics of American Medicine* (New York: Macmillan, 1964).

75. W.J. Baumol and W.G. Bowen, *Performing Arts - The Economic Dilemma*: A Study of Problems Common to Theater, Opera, Music and Dance (New York: Twentieth Century Fund, 1966).

76. S. Harris suggests that "without the profit objective, the scrutiny of cost suffers. The charity and philanthropic concepts associated with hospitals have tended to minimize cost consciousness and to retard the development and use of cost analysis procedures", *op.cit*., p. 198.

77. Department of Education and Science, *Trends in Education*, No. 1, January, 1966 (London: H.M.S.O., 1966), p. 1.

Appendix 1

Calculation of the "Academic" Index of Output 1953-63

Since 1961 information has been collected by the Department of Education and Science, on the G.C.E. attainments of school-leavers, by means of a sample survey, and this information was used to construct this index, but before that date no adequate information existed on the number of passes at "A" and "O" level per school-leaver. Estimates were made, however, for the Robbins Report, of the G.C.E. qualifications of school-leavers since 1953-54, based on trends in total number of passes. The method of estimation is outlined in Robbins Report (op. cit.) Appendix 1, p. 105-8 and Annex R, p. 253-5.

Unfortunately, these estimates cannot be used directly to calculate an index of output with G.C.E. qualifications as weights, since the figures refer to pupils from all schools, including direct-grant and independent schools, as well as maintained secondary schools. The figures also include only those leavers with at least 5 'O' Level passes; no estimates were made of the number of leavers with 1 to 4 'O' Level passes before 1960-61. We have therefore revised the estimates in the Robbins Report by assuming a) that the proportion of school-leavers with G.C.E. qualifications from maintained schools corresponded to the proportion of G.C.E. candidates from maintained schools during the period 1953-1960; b) the trend in numbers of leavers with 1, 2, 3 or 4 'O' Level passes corresponded to the trend in the number of leavers with at least 5 'O' Level passes. Between 1953 and 1960 the number of leavers with at least 5 'O' Levels was steadily rising, so we have assumed that this was matched by an equivalent increase in the number of leavers with up to 4 'O' Level passes.

A simple weighting system was then adopted: those school-leavers with no G.C.E. passes were given a weight of 1; those with 1 or 2 'O' Levels were weighted by 2, those with 3 or 4 'O' Levels by 3, those with 5 or more 'O' Levels by 4, those with 1 'A' Level pass by 5, those with 2 'A' Levels by 6 and those with 3 'A' Levels by 7.

The index of educational output based on this weighting system is given in the table below. The weighting is to some extent arbitrary, but the index does reflect the increasing numbers of qualified school-leavers. Different values for the index could have been obtained by giving greater weight to 'A' Level passes, but the weights would have had to be very much higher to reverse the productivity trend. The 'academic' weights would have to be more than doubled before the increase in output matched the increase in inputs between 1953-63.

"Academic" Index of Educational Output 1953-63

1953 = 100

1953-54	100.0
1954-55	100.3
1955-56	99.6
1956-57	107.5
1957-58	115.1
1958-59	124.0
1959-60	132.5
1960-61	136.7
1961-62	159.4
1962-63	161.8
1963-64	167.6

Appendix II

Table II.1 : Indices of Educational Output 1950-63
(1950 = 100)

	Unweighted	"Length of Schooling" Index	"Economic" Index
1950-51	100.0	100.0	100.0
1951-52	97.2	97.2	97.1
1952-53	102.0	102.3	102.5
1953-54	102.5	103.2	103.6
1954-55	99.9	101.1	102.2
1955-56	95.1	97.0	n. a.
1956-57	102.6	104.3	n. a.
1957-58	109.4	111.5	n. a.
1958-59	116.4	118.9	121.9
1959-60	117.6	121.5	125.2
1960-61	119.9	122.6	128.7
1961-62	143.6	148.0	152.5
1962-63	134.9	142.0	149.1
1963-64	129.8	138.7	146.3

Table II.2 : Indices of Educational Output 1953-63
(1953 = 100)

"Length of

Appendix II

Table II.1 : Indices of Educational Output 1950-63 (1950 = 100)

	Unweighted	"Length of Schooling" Index	"Economic" Index
1950-51	100.0	100.0	100.0
1951-52	97.2	97.2	97.1
1952-53	102.0	102.3	102.5
1953-54	102.5	103.2	103.6
1954-55	99.9	101.1	102.2
1955-56	95.1	97.0	n. a.
1956-57	102.6	104.3	n. a.
1957-58	109.4	111.5	n. a.
1958-59	116.4	118.9	121.9
1959-60	117.6	121.5	125.2
1960-61	119.9	122.6	128.7
1961-62	143.6	148.0	152.5
1962-63	134.9	142.0	149.1
1963-64	129.8	138.7	146.3

Table II.2 : Indices of Educational Output 1953-63 (1953 = 100)

	Unweighted	"Length of Schooling Index	"Economic" Index	"Academic" Index
1953-54	100.0	100.0	100.0	100.0
1954-55	97.4	97.9	96.5	98.6
1955-56	92.7	93.9	n. a.	100.1
1956-57	100.0	101.1	n. a.	108.0
1957-58	106.6	108.0	n. a.	115.6
1958-59	113.5	115.2	117.6	124.7
1959-60	114.7	117.7	120.8	133.7
1960-61	116.9	118.8	124.2	130.4
1961-62	140.0	143.4	147.2	150.3
1962-63	131.5	137.6	143.9	152.1
1963-64	126.5	134.4	141.2	157.7

Appendix III

Table III.1 : Estimated Earnings Foregone by Pupils in School 1950-63
£p.a. (current prices)

Year / Age	15	16	17	18
1950-51	130	166	200	236
1951-52	140	179	216	255
1952-53	152	194	234	276
1953-54	164	209	252	297
1954-55	173	220	266	314
1955-56	192	245	296	349
1956-57	212	270	326	385
1957-58	220	292	340	401
1958-59	230	294	354	417
1959-60	239	305	368	434
1960-61	257	328	396	467
1961-62	286	365	440	519
1962-63	298	380	460	540
1963-64	304	388	468	552

Source: Extrapolations from Estimates in Crowther Report and Robbins Report.

Table III.2 : Index of Average Juvenile Earnings 1950 = 100

1950 -51	100
1951-52	108

Appendix III

Table III.1 : Estimated Earnings Foregone by Pupils in School 1950-63
£p. a. (current prices)

Year / Age	15	16	17	18
1950-51	130	166	200	236
1951-52	140	179	216	255
1952-53	152	194	234	276
1953-54	164	209	252	297
1954-55	173	220	266	314
1955-56	192	245	296	349
1956-57	212	270	326	385
1957-58	220	292	340	401
1958-59	230	294	354	417
1959-60	239	305	368	434
1960-61	257	328	396	467
1961-62	286	365	440	519
1962-63	298	380	460	540
1963-64	304	388	468	552

Source: Extrapolations from Estimates in Crowther Report and Robbins Report.

Table III.2 : Index of Average Juvenile Earnings 1950 = 100

1950 -51	100
1951-52	108
1952-53	117
1953-54	123
1954-55	133
1955-56	148
1956-57	160
1957-58	170
1958-59	175
1959-60	184
1960-61	203
1961-62	215
1962-63	222
1963-64	232

Source: Ministry of Labour Gazette

Appendix IV

Table IV. 1. Indice of Educational Inputs 1950-63 (in real terms. 1950 = 100)

	Teachers	Administrative Staff and Maintenance	Equipment and Furniture	Books and Stationery	Buildings Buildings	Pupil Time
1950-51	100	100	100	100	100	100
1951-52	105	103	103	109	104	104
1952-53	107	104	97	107	110	109
1953-54	111	109	106	113	116	115
1954-55	115	122	116	117	123	121
1955-56	125	139	126	143	133	125
1956-57	135	153	136	146	146	131
1957-58	148	162	146	163	162	147
1958-59	161	170	167	176	175	165
1959-60	176	183	193	199	185	188
1960-61	188	203	213	210	195	195
1961-62	200	215	223	203	204	225
1962-63	204	231	223	200	213	261
1963-64	210	241	233	203	220	285

Index of Total Inputs calculated on "cohort" basis

The index of total inputs has been recalculated to take account of the fact that school-leavers in any one year have consumed inputs during the previous four to eight years, according to their length of schooling. In each year school-leavers are classified, by age, into cohorts, and separate estimates are then made of the inputs consumed during previous years by each cohort. It is assumed that the proportion of total inputs consumed by a cohort in any year corresponds to the proportion of the total secondary school population formed by the cohort in that year. Thus the output of fifteen-year old leavers in 1963-4 is related not to total inputs in 1963-4 but to an estimate of the inputs devoted to that cohort during the previous four years. A similar calculation is made for each age-cohort, and the final estimate of inputs for each year represents the total inputs consumed during the previous four to eight years by pupils leaving school in that year.

It is possible to recalculate the input index in this way only as far back as 1957-8; to recalculate inputs for the period 1950-1 to 1957-8 would require details of total inputs before 1950-1, and comparable information is not available for earlier years. We have, therefore, recalculated the index of inputs for 1957-8 to 1963-4, and compared this with actual inputs in the period before 1957-8. Thus the uncorrected figure for total inputs in 1950-1 will be slightly higher than a corrected estimate, and the following index slightly underestimates the rise in inputs and, therefore, the fall in productivity.

Table IV. 2

	Index of total Inputs		Index of Inputs Excluding Pupil Time	
	1950 = 100	1953 = 100	1950 = 100	1953 = 100
1950-51	100		100	
1951-52	104		104	
1952-53	108		107	
1953-54	112	100	111	100
1954-55	118	106	118	106
1955-56	128	114	130	116
1956-57	137	122	141	126
1957-58	151	135	154	138
1958-59	165	147	166	149
1959-60	181	162	180	162
1960-61	192	172	193	173
1961-62	208	186	208	186
1962-63	222	199	210	188
1963-64	235	209	218	195

Table IV. 3. Index of Total Inputs - "cohort" basis

	1950 = 100	1953 = 100
1950-51	1000	
1951-52	104*	
1952-53	108*	
1953-54	113*	100*
1954-55	119*	105*
1955-56	128*	114*
1956-57	138*	123
1957-58	144	128
1958-59	147	130
1959-60	161	143
1960-61	168	149
1961-62	206	183
1962-63	208	185
1963-64	214	190

* These figures are not calculated on the "cohort" basis due to lack of data; they are, therefore, slightly higher than the true "cohort" figures for these years.

Table IV.4 . Indice of Educational Inputs Per Pupil, 1950-63

(in real terms 1950 = 100)

	Teachers	Administrative Staff and Maintenance	Equipment and Furniture	Books and stationery	Buildings	Pupil Time	Total
1950-51	100	100	100	100	100	100	100
1951-52	103	101	100	105	103	103	103
1952-53	104	103	94	100	108	106	105
1953-54	104	106	100	105	110	108	107
1954-55	103	106	100	105	112	108	106
1955-56	104	111	100	116	113	104	107
1956-57	105	113	106	111	117	103	108
1957-58	109	114	106	116	121	108	112
1958-59	107	111	106	116	117	109	110
1959-60	110	111	117	122	117	118	114
1960-61	113	122	122	122	119	118	117
1961-62	120	133	128	122	124	135	127
1962-63	125	140	133	122	133	162	138
1963-64	127	146	139	122	135	172	142

Indices of Educational Productivity, 1950-63

Table IV.5 : Using Index of Total Inputs
(1950 = 100)

	Unweighted Output Index	"Length of Schooling Index	"Economic" Index
1950-51	100	100	100
1951-52	93	93	93
1952-53	94	95	95
1953-54	91	92	92
1954-55	85	85	86
1955-56	74	75	n. a.
1956-57	74	75	n. a.
1957-58	72	73	n. a.
1958-59	70	72	73
1959-60	65	66	68
1960-61	62	63	66
1961-62	69	71	73
1962-63	61	63	66
1963-64	55	59	62

Table IV.6 : Using Index of Total Inputs
(1953 = 100)

	Unweighted Output Index	"Length of Schooling Index	"Economic" Index	"Academic" Index
1953-54	100	100	100	100
1954-55	92	93	91	95

Indices of Educational Productivity, 1950-63

Table IV.5 : Using Index of Total Inputs (1950 = 100)

	Unweighted Output Index	"Length of Schooling Index	"Economic" Index
1950-51	100	100	100
1951-52	93	93	93
1952-53	94	95	95
1953-54	91	92	92
1954-55	85	85	86
1955-56	74	75	n. a.
1956-57	74	75	n. a.
1957-58	72	73	n. a.
1958-59	70	72	73
1959-60	65	66	68
1960-61	62	63	66
1961-62	69	71	73
1962-63	61	63	66
1963-64	55	59	62

Table IV.6 : Using Index of Total Inputs (1953 = 100)

	Unweighted Output Index	"Length of Schooling Index	"Economic" Index	"Academic" Index
1953-54	100	100	100	100
1954-55	92	93	91	95
1955-56	81	82	n. a.	87
1956-57	82	82	n. a.	88
1957-58	79	80	n. a.	85
1958-59	77	78	80	84
1959-60	71	73	74	82
1960-61	68	69	72	79
1961-62	75	77	79	86
1962-63	66	69	72	81
1963-64	60	64	67	80

Table IV. 7. Using Index of Inputs Excluding Pupil Time

(1950 = 100)

	Unweighted Output Index	"Length of Schooling" Index	"Economic" Index
1950-51	100	100	100
1951-52	93	93	93
1952-53	95	96	96
1953-54	92	92	93
1954-55	85	86	86
1955-56	68	75	n.a.
1956-57	73	74	n.a.
1957-58	71	72	n.a.
1958-59	70	71	73
1959-60	65	67	69
1960-61	62	63	66
1961-62	69	71	73
1962-63	64	67	71
1963-64	60	64	67

Table IV.8. Using Index of Inputs Excluding Pupil Time
(1953 = 100)

	Unweighted Output Index	"Length of Schooling" Index	"Economic" Index	"Academic" Index
1953-54	100	100	100	100
1954-55	92	93	91	95
1955-56	80	81	n.a.	86
1956-57	80	80	n.a.	85
1957-58	77	78	n.a.	83
1958-59	76	77	79	83
1959-60	71	73	75	82
1960-61	67	68	72	79
1961-62	75	77	79	86
1962-63	70	73	77	86
1963-64	65	69	72	86

Table IV.9 : Using Index of Inputs Calculated on "cohort" basis (1950 = 100)

	Unweighted Output Index	"Length of Schooling" Index	"Economic" Index
1950-51	100*	100*	100*
1951-52	93*	93*	93*
1952-53	95*	95*	95*
1953-54	91*	92*	92*
1954-55	84	85*	86*
1955-56	74*	75*	n. a.
1956-57	74*	76*	n. a.
1957-58	76	77	n. a.
1958-59	79	81	83
1959-60	73	76	78
1960-61	71	72	77
1961-62	70	72	74
1962-63	65	68	72
1963-64	61	65	68

Table IV.10 : Using Index of Inputs Calculated on "cohort" basis (1953 = 100)

	Unweighted Output Index	"Length of Schooling" Index	"Economic" Index	"Academic" Index
1953-54	100*	100*	100*	100*
1954-55	92*	93*	91*	95*
1955-56	81*	82*	n. a.	87*
1956-57	82*	82*	n. a.	88*
1957-58	82	85	n. a.	90
1958-59	87	89	90	95

Table IV.9 : Using Index of Inputs Calculated on "cohort" basis (1950 = 100)

	Unweighted Output Index	"Length of Schooling" Index	"Economic" Index
1950-51	100*	100*	100*
1951-52	93*	93*	93*
1952-53	95*	95*	95*
1953-54	91*	92*	92*
1954-55	84	85*	86*
1955-56	74*	75*	n. a.
1956-57	74*	76*	n. a.
1957-58	76	77	n. a.
1958-59	79	81	83
1959-60	73	76	78
1960-61	71	72	77
1961-62	70	72	74
1962-63	65	68	72
1963-64	61	65	68

Table IV.10 : Using Index of Inputs Calculated on "cohort" basis (1953 = 100)

	Unweighted Output Index	"Length of Schooling" Index	"Economic" Index	"Academic" Index
1953-54	100*	100*	100*	100*
1954-55	92*	93*	91*	95*
1955-56	81*	82*	n. a.	87*
1956-57	82*	82*	n. a.	88*
1957-58	82	85	n. a.	90
1958-59	87	89	90	95
1959-60	80	82	85	93
1960-61	78	80	83	92
1961-62	77	78	80	87
1962-63	71	74	78	88
1963-64	67	71	74	88

* These figures are not calculated on "cohort" basis, due to lack of data. They are, therefore, slightly higher than the true "cohort" figures for these years.

ANALYSE COMBINEE DE RENDEMENT ET DE COUT

par Nguyen Huu Chau

1. On peut étudier l'efficacité de l'utilisation des ressources dans le système d'enseignement sous deux aspects: l'un qualitatif, l'autre quantitatif.

H. Correa[1] a envisagé le problème sous l'aspect qualitatif en traitant des "micro-learning curves".

L'étude de Kershaw et Mac Kean[2] fournit un exemple d'analyse de l'efficacité de l'utilisation des ressources sous le même aspect.

On peut aussi envisager ce problème sous l'aspect "quantitatif". La recherche de la taille optima d'un établissement scolaire se rattache à ce type d'évaluation.[3]

Dans les deux cas, on analyse une fonction de coût: Dans le premier, le coût optimum correspond au coût au dessus duquel le niveau de connaissances de l'élève n'augmente plus. Dans le second, l'effectif optimum correspond au coût moyen le plus bas.

2. Mais l'efficacité de l'utilisation des ressources peut avoir un aspect à la fois qualitatif et quantitatif sous la forme de la promotion des effectifs scolaires.

Cette note a pour objet d'étudier cet aspect par une analyse combinée de rendement et de coût.

3. Si l'on définit le cycle comme l'ensemble des cours successifs qu'un élève doit suivre pendant une période réglementaire donnée pour atteindre un

---

[1] H. Correa, The Economics of Human Resources, Edit. North Holland Pub. Company 1963, Page 106.

[2] Kershaw et Mac Kean, Systems Analysis and Education, Santa Monica 1959.

[3] Cf. les études citées par F. Edding dans "Méthodes d'analyse des dépenses d'enseignement", Unesco 1967.

niveau d'enseignement donné, on peut définir le rendement[1] du système d'enseignement pour ce niveau par le rapport entre le nombre d'élèves qui "sortent" du système à la fin du cours terminal par rapport au nombre d'élèves inscrits dans le cours initial au début de la période.

Bien qu'il s'agisse d'un rapport entre deux nombres (deux quantités physiques), la notion recouvre des phénomènes qualitatifs, un mauvais enseignement se traduisant en principes par des redoublements et des abandons, mais elle exprime aussi ces phénomènes sous une forme quantitative puisque les déperditions ont une incidence sur la promotion des élèves pendant le cycle d'études jusqu'à son achèvement.

4. On représente ce processus par les schémas ci-après.[2] On peut considérer que pour avoir bénéficier d'un enseignement complet les élèves qui sortent du cycle constituent des "produits finis".

5. A la dernière étape du processus, on peut distinguer plusieurs ensembles plus ou moins significatifs.

a) Ou la totalité des élèves qui se trouvent inscrits dans le cours terminal; parmi eux un certain nombre ont redoublé.

b) Ou seulement l'ensemble de ceux qui quitteront le dernier cours (les sortants).

---

[1] Des autres définissent la productivité physique en économie comme un rendement en nature. Cf. Courtheoux, La répartition des activités économiques, Paris 1966, Page 15.

[2] Pour la méthodologie Cf. IEDES, Les rendements de l'enseignement du premier degré en Afrique francophone, Sous la direction d'Isabelle Deblé. Tome 1, Présentation méthodologique.

c) Ou l'ensemble de ceux qui passeront un examen et obtiendront un diplôme.

d) Ou encore l'ensemble de ceux qui passent au degré d'enseignement immédiatement supérieur.

6. On sait évidemment que pour un cycle de formation de 6 années chacune de ces catégories comprend des élèves qui ont pu redoubler plusieurs fois et ont fait par conséquent une scolarité de plus de six années. Mais du point de vue de la prévision des "flux" (nombre d'élèves ayant atteint un niveau d'études donné à un moment donné) et du point de vue de la planification des ressources humaines, le nombre des sortants (ou des diplômés) seul importe.

7. Lorsqu'on se trouve en présence de deux systèmes d'enseignement ayant des structures comparables, le rendement dans le sens ci-dessus permet de comparer l'efficacité de ces deux systèmes en termes réels.

On fait le même genre de comparaison lorsqu'on compare les rendements en blé de deux terres de superficie égale (rendements physiques).

8. Mais pour obtenir un "flux" d'élèves d'un niveau de formation donné, il faut utiliser des "inputs" en capital physique et "humain", qui ont un coût monétaire.

L'application des coûts unitaires (naturellement variables d'un système à un autre, ou pour un même système à deux périodes différentes) permet d'étudier l'efficacité de l'utilisation des ressources, d'un point de vue économique.

- Les statistiques scolaires permettent de représenter la progression des effectifs du premier cours d'un cycle donné jusqu'au cours terminal.

Il s'agit d'une progression apparente puisque sur l'effectif de chaque cours pendant la durée du cycle, un certain nombre d'élèves abandonnent, un certain nombre d'autres élèves redoublent, et que l'effectif du cours suivant comprend non seulement des nouveaux inscrits mais aussi des redoublants.

- Lorsque les statistiques renseignent sur le nombre de redoublants dans les différents cours, pour plusieurs années, ces informations permettent de calculer le nombre des abandons.

9. Les Tableaux I et II ci-après représentent la promotion dans une progression type[1] des élèves de l'enseignement primaire public au Cameroun suivant les statistiques disponibles de 1961-1962 à 1965-1966 et au Sénégal de 1962-1963 à 1964-1965, avec une répartition entre redoublants, nouveaux inscrits, et sortants pour chaque cours.[1]

10. Dans le cas du Cameroun, les effectifs du Cours moyen 2ème année (CM2) s'élèvent à 398 parmi lesquels figurent 131 redoublants. Mais sur ces 398 élèves, 148 redoubleront (37,2%) et 250 (le reste) sortiront du cycle.

On peut calculer le rendement en prenant pour base de calcul soit le chiffre de 398, soit le chiffre de 267 (nouveaux inscrits dans le cours) soit le chiffre de 250.

11. Dans le cas du Sénégal, on peut prendre pour base de calcul soit le chiffre de 852, soit le chiffre de 630 nouveaux inscrits, soit le chiffre de 585.

12. L'introduction des coûts dans l'analyse suppose un calcul préalable des coûts unitaires (coûts directs, coûts indirects, coûts d'intervention, chacun de ces coûts comprenant des dépenses de capital et des dépenses de fonctionnement).[2]

En général, les statistiques ne fournissent aucun renseignement sur la consommation de capital; on ne peut donc calculer que les coûts de fonctionnement. La présente note se limite pour cette raison à une application des coûts directs en personnel enseignant.

1/ Pour les terminologies Cf. document IEDES précité.

2/ Sur les différents concepts de coûts applicables à l'éducation, Cf. Nguyen Huu Chau, Les coûts de l'éducation - Tiers Monde - juin 1965.

Tableau I

CAMEROUN

Rendement de l'enseignement primaire public (1961-62 - 1965-66)

			Ci	CP	CE1	CE2	CM1	CM2
t	R Ni	388) 612) ←	1 000					
t + 1		532	172) 468) ←	640				
t + 2			259	118) 381) ←	407			
t + 3				48	86) 321) ←	407		
t + 4					119	91) 288) ←	379	
t + 5						112	131) 267) ←	398
							250	

Unité de produit: sortant. Total: 250

Tableau II

SENEGAL

Rendement de l'enseignement primaire public (1962-63 - 1964-65)

		Ci	CP	CE1	CE2	CM1	CM2
t	$\frac{133}{867}$) ←	1 000					
t + 1	147	$\frac{127}{853}$) ←	980				
t + 2		209	$\frac{106}{771}$) ←	877			
t + 3			166	$\frac{101}{711}$) ←	812		
t + 4				147	$\frac{116}{665}$) ←	781	
t + 5					151	$\frac{222}{630}$) ←	852
						585	

Unité de ce produit total: 585

13. Connaissant le coût d'une année élève, on peut calculer le coût de formation effectif d'un élève qui est parvenu à la fin du cycle en tenant compte:

a) du nombre d'années d'étude des élèves qui sont parvenus à la fin du cycle sans avoir redoublé;

b) du nombre d'années d'étude des élèves qui sont parvenus à la fin du cycle après avoir redoublé une ou plusieurs fois;

c) du nombre d'années d'étude des élèves qui ont abandonné leurs études.

14. A condition que les statistiques disponibles permettent de reconstituer très exactement la carrière de chaque élève, ce qui n'est jamais le cas, on pourrait comparer les coûts de formation effectifs des élèves ayant reçu un enseignement complet de même niveau, dans 2 pays, ou à deux époques différentes dans un pays. Mais ce faisant, on ne comparerait que des coûts en valeur absolue.

15. Si l'on veut rendre compte de la "productivité" dans le sens courant de ce mot, il faut rapporter le "produit" du système d'enseignement (en terme de promus, de sortants) aux facteurs de production et à leurs coûts.

16. On peut ainsi calculer la "productivité" de l'ensemble des facteurs, ou la productivité d'un de ces facteurs, par exemple le travail du personnel enseignant.

17. La mesure de la "productivité" qui se distinguerait ainsi de l'évaluation du rendement (en termes réels) et d'une simple comparaison de coûts, s'exprimerait par le supplément de coût (résultant des redoublements et des abandons) par rapport au coût de formation théorique minimum, à imputer à chaque élève sortant.

En considérant comme "produit" l'ensemble des "sortants", et en appliquant les coûts directs[1] d'enseignement des sortants, on a obtenu les résultats suivants pour l'enseignement public au Cameroun et au Sénégal.

---

[1] Evaluation pour 1965-66 dans SEDES Paris, 1967, Recherches sur les coûts de l'enseignement primaire à Madagascar et dans 8 pays francophones d'Afrique, Tome II, Page 31.

ANALYSE COMBINEE DE RENDEMENT ET DE COUT

Enseignement primaire Cameroun - Sénégal

Nombre de sortants sur 1 000 élèves inscrits au cours initial	Coût unitaire (année-élève) Direct. personnel	supplément de coût par élève sortant
CAMEROUN 250/1 000	4 725 F CFA[1]	53 090 F CFA
SENEGAL 585/ 100	11 928 F CFA[2]	52 952 F CFA

[1] Evaluation pour 1965-66 dans SEDES Paris, 1967, Recherches sur les coûts de l'enseignement primaire à Madagascar et dans 8 pays francophones d'Afrique, Tome II, Page 31.

[2] Evaluation IIEP, Ta Ngoc Chau, Les dépenses d'enseignement en 1961 et 1964 au Congo Brazzaville et au Sénégal, 1965, Page 21.

18. Il résulte de ces chiffres, que l'on doit considérer le rendement en termes réels du système scolaire du Cameroun comme plus mauvais que celui du Sénégal. Mais en termes d'efficacité économique, les deux systèmes ont ou auraient une "productivité" comparable.

19. Nous avons effectué des calculs analogues pour l'enseignement secondaire général (lycées et collèges) du Dahomey et du Sénégal.

Nous avons choisi comme unité de "produit" le nouvel inscrit en classe terminale.

Le tableau de rendement du Dahomey comporte des "anomalies" évidentes, puisque les totaux des effectifs de chaque cours dépassent le chiffre 1 000. Ces anomalies s'expliquent par le fait qu'à la suite de l'accession du Dahomey et des pays voisins à l'indépendance, un grand nombre d'élèves dahoméens vivant hors du Dahomey sont revenus dans leur pays d'origine pour faire leurs études.

Malheureusement, nous n'avons pas pu, faute de statistiques, sur les redoublements, choisir un autre pays aux fins de comparaison avec le Sénégal.

Tableau III

DAHOMEY

Rendement de l'enseignement secondaire: Lycées, Collèges (1961-62 - 1965-66)

	Cl 6	Cl 5	Cl 4	Cl 3	Cl 2	Cl 1	Cl T
R Ni	$\left.\frac{75}{925}\right)$ ← 1 000						
		$\left.\frac{120}{1\,057}\right)$ ← 1 177					
			$\left.\frac{99}{935}\right)$ ← 1 034				
				$\left.\frac{234}{859}\right)$ ← 1 093			
					$\left.\frac{136}{987}\right)$ ← 1 123		
						$\left.\frac{210}{866}\right)$ ← 1 076	
							$\left.\frac{206}{757}\right)$ ← 963

Unité de produit: nouvel inscrit de la classe terminale (bachelier première partie)

total: 757

Tableau IV

SENEGAL

Rendement de l'enseignement secondaire (Lycées, Collèges) 1958-59 - 1965-66

	Cl 6	Cl 5	Cl 4	Cl 3	Cl 2	Cl 1	Cl T
R	151	97	97	102	80	142	66
Ni	849	724	621	540	478	349	287
	1 000	821	718	642	558	491	353

Unité de produit: nouvel inscrit de la classe terminale (bachelier première partie)

total: 287

ANALYSE COMBINEE DE RENDEMENT ET DE COUTS

Enseignement secondaire Lycée-- Collège
(Dahomey - Sénégal)

Nombre de nouveaux inscrits en classe terminale	Coût unitaire[1] (année élève) Direct. personnel	Supplément de coût par élève sortant
DAHOMEY 757/1 000	18 448 F CFA[2]	82 152 F CFA
SENEGAL 287/1 000	37 918 F CFA[3]	419 608 F CFA

[1] Evaluation IEDES à partir des données budgetaires. Pour le personnel de l'assistance technique dont la proportion, dans l'ensemble, diffère d'un pays à l'autre, on a appliqué les taux de rémunération du personnel enseignant national afin d'effectuer les calculs de coût unitaire sur des bases comparables.

[2] D'après le budget de 1965-66.

[3] D'après le budget de 1963-64.

20. Nous n'avons pas eu non plus la possibilité d'appliquer les coûts correspondants à l'année terminale des cycles étudiés, (qui constitueraient véritablement des coûts de remplacement).

21. Par ailleurs il convient de ne pas attacher aux évaluations de coût ci-dessus une précision rigoureuse, la documentation utilisée n'ayant pas permis d'obtenir un tel résultat.

22. Cette étude ne constitue qu'une application du concept économique de coût.[4] On peut suivre la même démarche pour comparer l'efficacité de l'utilisation

---

[4] Il existe d'autres applications possibles de l'analyse des coûts (prévision de financement, évaluation du coût de la formation intellectuelle et professionelle d'une population, ou des travailleurs d'un secteur économique, introduction du "facteur formation intellectuelle et professionnelle" dans une fonction de production.

des ressources de deux ensembles de 2 cycles ou 3 cycles consécutifs de plusieurs pays différents.[1]

L'intérêt de telles recherches semble évident pour la définition d'une politique rationnelle des effectifs.

23. Sur le plan de la méthodologie, cette étude s'apparente aux différents instruments d'analyse des systèmes qui s'imposent chaque fois qu'on se trouve en présence d'une production qui n'a pas de valeur monétaire en fonction d'un système de prix (de marché). L'analyse combinée de rendement et de coût offre l'intérêt de rendre compte de l'efficacité de l'utilisation des ressources selon une démarche proche de celle qu'on suit pour les analyses courantes de "productivité".

24. Elle offre aussi l'intérêt de mettre le praticien en garde contre les appréciations partielles auxquelles peuvent conduire de simples évaluations de rendement, ou de simples évaluations de coût.

Elle débouche sur de nombreuses questions importantes, telles que les suivantes:

a) le rapport optimum élèves/maître;

b) la répartition optimum des maîtres selon leur qualification entre les différents cours d'un cycle;

c) le niveau de rémunération des maîtres (on peut se trouver, en effet, devant une situation de sur-qualification ou de sous-qualification, ou une situation de sur-rémunération;

---

[1] On aboutirait sans doute à des conclusions différentes de celle de l'étude sur l'éducation en Amérique latine, en ce qui concerne la charge des déperditions: Unesco-IIEP, Problems and strategies of educational planning, 1965.

d) l'effet des dépenses d'intervention sur le rendement: transports, internat, bourses et différentes formes d'aide;

e) les avantages et les inconvénients de la sélection dans la promotion;

f) les effets du rythme de scolarisation sur l'efficacité de l'utilisation des ressources.

25. L'énumération de ces quelques problèmes montre que pour les pays en voie de développement, l'étude de l'efficacité de l'utilisation des ressources qui se distingue conceptuellement de l'étude des rapports entre niveaux d'éducation et revenus individuels, ou des effets économiques du développement de l'éducation, a une place importante dans l'économie de l'éducation.

SUMMARY

The purpose of this paper is to study the efficiency with which resources are used in an educational system by means of a combined analysis of productivity or output and unit cost.

The concept of output is used in the sense proposed by Isabelle Deblé, of the Institute for Economic and Social Development Studies (IEDES), to express the promotion of a given number of pupils or students over a given cycle of schooling, allowing for drop-outs and other enrolment losses.

This output expresses the concept of efficiency in real terms.

The introduction of unit costs into the analysis enables efficiency to be examined in monetary terms.

In comparison with productivity estimates in industrial economy, a study of efficiency in the utilization of resources in the field of education offers one peculiarity, namely that the output of a system of education and training has no exchange value based on a price system - only the inputs have a value in monetary terms.

The rating of productivity as value, in the ordinary meaning of this expression, is therefore not conceivable in the field of education.[1]

From the planning point of view, it is not only a question of obtaining the best output but of obtaining it at the lowest cost. It is not

---

[1] Unless a value is attributed to the output by the application of selected indicators.

sufficient, in fact, to set as a target a given flow of pupils or students having received a given level of instruction; it is also necessary to know whether the funds and resources have been utilized under the best conditions. In other words, it is important to determine at the same time the best quantity policy and the best cost policy.

A combined analysis of output and cost provides useful information for that purpose.

The kind of problem studied is distinct:

(1) From that of the ratio between educational level and individual return;

(2) From that of the contribution of education to economic growth.

PART D CONCRETE EXAMPLES

AREAS FOR IMPROVED EFFICIENCY IN EDUCATIONAL SYSTEMS

by J. Hallak

CONTENTS

Page

1. Introduction VIII - 1
2. The Targets VIII - 3
3. The Factors VIII - 5
4. The Process VIII - 8
5. Conclusion VIII -13

1. Introduction

1.1. The need for long-term, large-scale research projects concentrated on concepts and methods of analysis, so that we can improve our knowledge about the relationship between "factors consumed" and the "product" in educational systems is apparent. It will then become possible to trace and circumscribe those areas in which improved efficiency in education is possible. However, an examination of the situation in various countries, both developed and developing, shows that there is no need to wait for the results of such research before detecting the various areas in which it would be easy to increase efficiency. Before pinpointing those areas, two remarks may be useful, one on the mode of selection and the other on the mode of action.

1.2. The mode of selection. The possibilities of improving efficiency suggested in this note have been chosen on the basis of very general and often patchy information. Therefore, the list of areas of improvement given in this note can in no way be considered complete or describing the situation in any particular country. THE SOLE PURPOSE OF THIS PAPER IS TO TRACE THE MAIN GUIDELINES FOR FUTURE RESEARCH AS APPLIED TO CONCRETE PROBLEMS IN VARIOUS COUNTRIES. In other words, the situation existing in each particular case should be seriously studied so as to ensure that the selection of areas for improved efficiency is indeed based on actual conditions and consequently reflects the features of the educational system concerned.

1.3. *Mode of action*. If it is to be translated into action, selection must also be feasible. Here, as elsewhere, it should not be forgotten that education, while it resembles other sectors of production, is nevertheless distinct from them in that it is essentially concerned with human beings. IT CANNOT OPERATE WITHOUT TEACHERS AND FORGETTING TO HAVE THEM IN ON ANY DECISION AT THE DISCUSSION STAGE WILL SPELL FAILURE[1]. By definition, education's function is to train and educate pupils and students, i.e. human beings with their special type of behaviour, their reactions, their strengths and weaknesses. Overlooking this aspect not only implies failure but may also lead to systems that are even less efficient, which is contrary to the goal envisaged.

With the reservations given above, a very brief list of areas for improved efficiency in education is submitted, merely as illustration and to stimulate discussion.

1.4. It has commonly been noted that a lack of efficiency at the decision-making level is reflected by a lowering of productivity in education as a whole. Attempts by decision-making bodies to make their *objectives* coherent and rational should lead to a considerable increase in the productivity of education. Furthermore, since efficiency has been defined as "the capacity to produce maximum results with a constant effort or minimum effort with constant result", it is necessary, in order to improve efficiency, to change the nature and make-up of the *factors consumed* or even the nature of the system, i.e. of the *process* designed to produce education. Consequently, the efficiency of educational systems can be improved:

- by adjusting the *targets*;
- by making the best use of the factors *consumed*;
- by improving the *process*.

---

[1] Other interested bodies should also be consulted, e.g. families, industrial enterprises, local authorities, the central administration, etc.

2. The Targets

It is possible to provide some examples on the progress to be made by rationalizing decisions and by ensuring some degree of coherence between the selected goals and the steps taken to hit them.

2.1. Selecting the maintenance or extension of compulsory education up to a certain age might result in a marked lowering of efficiency in educational systems. For example, if the funds required to achieve this aim satisfactorily are beyond the means of the country concerned, compulsory schooling will be achieved to the detriment of school conditions (overcrowded classrooms, poorly qualified teachers[1], lack of teaching equipment). This can result in a lowering of educational performance (high repeat rate, small number of pupils completing a course) and be reflected by a drop in the efficiency of the system.

2.2. One objective that is rarely discussed is to achieve the maximum and best employment of manpower. Yet there are few cases where the measures taken towards training manpower tend to improve the balance between the type of training given to young people and the work offered them on the labour market. It is commonplace that in some areas there are too many job-seekers with arts degree and a scarcity of young people with scientific training. In several countries, the very high ratio between engineers and technicians is deplored. All this means that the educational systems are not training enough technicians. In many developing countries, the subjects taught at technical secondary schools do not very well correspond to the needs[1]. A rough estimate can show that the real impact of educational expenditure can be enormously increased merely by better adjusting measures taken for manpower training to the openings that might be offered to trained people. It is obvious that SUCH ADJUSTMENTS ARE NOT EASY TO MAKE BUT WITH SO MUCH AT STAKE every effort is justified.

---

[1] A survey conducted by the International Bureau of Education covering 83 countries in 1963 shows that the extension of compulsory schooling is one of the principal reasons for the shortage of qualified teachers. International Bureau of Education, Unesco - "Shortage of Primary teachers", Publication No. 256, 1963, Paris.

2.3. Lack of consistency among the various targets of an educational plan may contribute to inefficiency. For example, the desire for a very high expansion of secondary education is to some extent incompatible with the desire to maintain higher education at the same level of development. In the first place, if an efficient system of selection makes it possible for higher education to be excluded for the majority of those who have had a general secondary education, the result is that these young people have started along the road that they are not able to complete. If on the other hand the system of selection is not strong enough to resist the pressure of pupils completing general secondary education, the result will be that higher education expands to a greater degree than anticipated. In both cases[1] this means that the resources have been badly allocated, which inevitably implies a loss of efficiency in the educational system[2].

---

[1] One example among many is the Trade Centre at Yaba in Nigeria. There are 615 pupils and 230 are enrolled annually. Training is offered for 13 professions but "very little attention is paid to vocational guidance. All courses are geared to examination requirements and not to the needs of industry..." ("Survey of vocational training and technical education in Nigeria"). The authors commenting on technical education state: "The first major comment to be made with regard to technical education in Nigeria is to point to the fact that it is carried out with little or no regard to the needs of the country for skilled manpower or to the actual operations performed in industry... The team was told of a training programme for bricklayers that included the construction of English-type fireplaces - in a country with an average temperature of 80° F".

3. The factors

3.1. Enrolments per class : An examination of the student load per class in African and Latin-American universities evidences the high cost of higher education there. The same holds for technical and agricultural education. In some countries where per-capita income is less than $ 300, the unit cost per pupil or student is more than $ 5,000. Extending the size of classes, for example, by eliminating classes of less than 20, would allow cutting unit costs considerably. We are well aware of the serious obstacles to such a decision, entailing the dropping of part of the curriculum taught, regrouping of students, etc., when the situation of a country allows; such reforms should neverthless be encouraged.

---

[1] Unless secondary education is not designed to prepare pupils for university entrance but rather as an introduction to working life.

[2] An actual case illustrating this type of situation, although dealing with the relationship between the development of primary and secondary education, comes from the Ivory Coast : "Young people who obtain their leaving certificate (15, 345 in 1963/64) cannot all go on to secondary school. At this level there is a real bottleneck, as there are only 6,200 vacancies in the first year of secondary school. What happens to those pupils ? They have no technical or vocational training and the Ivory Coast Government is trying to find solutions which will enable them to obtain the rudiments of a technical education, e.g. post-terminal classes, farm schools, rural workshops". (See "Statistiques : situation de l'enseignement au 1 janvier 1964"

HIGHER EDUCATION

	Year	Student/Teacher ratio	Recurrent unit cost in % of per capita income (1962-63)
Brazil	1963/64	4 - 5	-
Chile	1964/65	3 - 4	200
Colombia	1963/64	5 - 6	360
Congo (Dem.Rep.)	1963/64	5	-
El Salvador	1963/64	6 - 7	230
Liberia	1964/65	5 - 6	-
Sierra Leone	1963/64	5 - 6	960
Sudan	1963/64	7 - 8	2 680

Source: The figures in this table are drawn up on the basis of data contained in: Nations Unies - "Revue mensuelle de statistiques, Février 1967", United Nations, New York, and Unesco - "Annuaire Statistique 1965," Unesco, Paris.

3.2 Use of teaching staff. Although qualified teachers are a rare commodity, they are insufficiently and inadequately used.

3.2.1 An insufficiently used resource. In fact, it should be noted that, in some countries, the higher qualified the teacher, the less lectures he is called upon to give. The main reason for this state of affairs is that highly-qualified teachers not only have to do extra work besides teaching, but also to keep up-to-date through research or by pursuing their training. Whenever such is the case, so much the better. But this is not always the case and the fact that the number of hours worked weekly is low often enables teachers either to cumulate two lectureships or to work in two jobs and thus to receive double pay. The influence on education of such cases is unfavourable both in terms of cost[1] and in terms of yield, as the efficiency of a teacher, however conscientious he may be, must inevitably suffer if his working week is too long.

---

[1] It might be claimed that the salaries of qualified teachers are too low to be tempting and that it is only because they can do other work simultaneously that teachers take up the profession. While this is possible the proof that it works that way has yet to be made.

3.2.2. Qualified teachers are inadequately used. A teacher giving twenty hours of instruction per week also devotes some time to supplementary tasks such as correcting homework, keeping registers up to date, preparing lessons and laboratory tasks, etc. Some of these tasks are the responsibility and can be the responsibility only of a qualified teacher; others, however, can be left to less qualified staff. More particularly in the countries in which, in order to make it possible to increase the facilities for compulsory education, large numbers of poorly qualified monitors are employed, a review of the job descriptions of teaching staff is necessary if there is not to be a marked decline in educational output and yield.

This is a most complicated PROBLEM which not merely AFFECTS the ECONOMIC ASPECTS of teaching (salary scales) but also the other ASPECTS OF STATUS WHICH CAN ONLY BE DEALT WITH CONCRETELY AND AFTER REFLECTION AND SOPHISTICATED RESEARCH. I mention this problem nevertheless because I consider it vital.

3.3. The use of facilities. In some countries, classrooms are unavoidably used by two groups of pupils. This is certainly advantageous from the point of view of school operating costs but generally affects the performance of pupils adversely, e.g. shorter school hours, etc. Organizing schools for their use by two groups of pupils means rearranging the length of the school year, educational courses and curricula.

In general, the common rooms (gymnasia, laboratories, workshops, etc.) are little used. Schools below a certain size should have facilities that can be used for a variety of purposes.

3.4. Audio-visual media. Several studies have shown the importance of making as much use as possible of audio-visual media to facilitate the solution of specific problems. For exemple, it has been demonstrated that radio or television educational programmes broadcast under good conditions can provide a very high marginal yield if used in support of lectures given by a monitor.

3.5. School buildings. The rational location of new school buildings and the selection of the right type (boarding schools, mixed boarding, and day schools) on the basis of cost/benefit analysis will lead to a marked lowering of unit costs. Competition between local authorities for the building of new schools and the current habit of building boarding schools without sufficient reason or care contribute to wasting the funds available and thus to harming the expansion of education as a whole. Furthermore, the standard of living in the boarding schools of some countries is higher not only than that of the pupils' families but also than that the students can expect to enjoy after entering working life, and this obviously has disadvantages. The more economic operation of boarding schools in all respects is desirable, naturally WITH THE RESERVATION THAT THE STANDARD OF LIVING IS ADEQUATE AND THE CONDITIONS OF HYGIENE SATISFACTORY.

4. The process

4.1. Curricula. The newly-independent countries have very rarely planned curricula adapted to their needs, but have in general adopted those of the countries on which they previously depended, which had the simple advantage of availability. This results in waste. The educational authorities are increasingly improving those curricula by adapting them to actual conditions in the country concerned and for the benefit of all.

Furthermore, the high cost of trained staff encouraged educational authorities to include in curricula more time for work required of pupils outside the schools and to lessen the duration of supervised work. THIS HAS ITS DISADVANTAGES but is perhaps a good solution when the funds available are inadequate for the needs.

4.2. The school year. The following table gives the duration of the school year in ten countries.

DURATION OF SCHOOL YEAR

Country	Days worked (per annum)	Working weeks	Days worked (per week)	Hours per annum
Brazil	180	30	5 - 6	810
France	184	37	5	1,110
Germany	233	39	6	802 - 1,092
India	200	40	6	800 - 1,000
Japan	210 (monthly)	35 (monthly)	6	840 - 1,185 1/
Turkey	170 - 200	-	5	845 - 940 2/
U.A.R. (Egypt)	175 (monthly)	29	6	615 2/
U.K.	200 (monthly)	40	5	600 - 800 (minimum)
U.S.A.	180	-	5	810 - 1,080
U.S.S.R.(KSFSR)	210 - 234	35 - 39	6	840 - 1,326

Source: "Statistics on comparative education in selected countries"

1/ 1 lesson period = 45 minutes

2/ estimates

It should be noted that the figures given in the table are the number of hours spent in class and do not include the work done by pupils outside school; they therefore loose meaning if we are concerned with the overall work done by pupils. Furthermore, teachers will certainly agree that there are disadvantages involved if the school year extends beyond certain limits. For all these reasons, extending the length of the school year cannot be recommended as a universal method of improving the efficiency of education. However, in view of the shortage of available funds, prolonging the school year and altering class periods and holidays may be - and are being - considered for some types of education and for older pupils. These steps will make it possible for the unit costs of education to be lowered, since the bulk of educational costs do not vary because of the length of the school year. Prolonging the school year by 10% (3 weeks to a month) would not seem impossible in some cases and hourly costs could then be lowered by the same amount[1/]. If such a measure is to be effective, however, it implies a concurrent increase in the effort required of pupils outside the classroom.

4.3. Length of courses. By increasing the length of the school year, the length of the course is already decreased, although the quantity of education supplied does not change significantly. On condition that curricula are rearranged, it is possible in several countries to reduce the length of courses by from 15 to 20%. WHILE SUCH REARRANGEMENTS CERTAINLY HAVE DISADVANTAGES, the alternative is generally as follows: to give to a reduced number of pupils an expensive but good-quality education, or to enrol a larger proportion of pupils in conditions which, while modest, are most satisfactory in the light of the needs and possibilities of the country concerned.

LENGTH OF COURSES
(in number of years)

Country	Primary	Secondary
Afghanistan	5	6
Basutoland	8	5
Brazil	4 (5)	7
Ceylon	5	7
France	5	5 - 7
Indonesia	6	5
Mexico	5	5
Portugal	4	7
Togo	6	7

Source: 1955 Statistical Yearbook, Unesco

[1/] I am well aware that there are great obstacles in the way of implementing such a measure, but this is no reason for discarding it outright. It should be remembered that the aim is not so much to effect savings at the expense of a particular vocational group as to check the extent to which it is possible to provide the largest possible number with education with the same available means.

More specifically, it would be perfectly feasible to plan as follows : (1) a short primary level, e.g. four years, to teach the "three R's" to a very large proportion of the population; (ii) a secondary level, more or less selective depending on the funds the State can supply, and more or less long depending on the orientation given to pupils. The provisional adoption of a system that would delay pupil's guidance as long as possible does not prevent a return to a longer primary course as soon as funds are available.

4.4. System of promotion. A policy of deliberate repeats for pupils is common practice in some countries. Apart from the very high cost of this policy and its very doubtful efficiency [1], the direct consequence is to favour pupils repeating a class at the expense of would-be new pupils for whom there is then no room in the schools.

4.5. Examination procedures. Very often, these should be completely rethought. The harmful effects of current examination systems are many : their cost, the high proportion of failures who repeat, the very low value of the content of the examinations themselves, cramming, etc.

DROP-OUT FIGURES IN THE FIRST YEAR OF PRIMARY SCHOOL : NIGERIA (WESTERN REGION)

Year	(1) Total enrolments	(2) Drop-outs	(2)/(1)
1959	161 255	33 463	20.7%
1960	169 601	34 304	20.3%
1961	179 239	42 023	23.5%
1962	176 684	41 178	23.3%
1963	178 624	39 802	22.3%
1964	186 402	47 002	25.2%

Source : "Some trends in Education in the Western Region of Nigeria, 1955-1965".

---

[1] A nation-wide survey held in Tunisia in May 1964, which affected 5,300 candidates for the State examination (end of secondary school), showed that candidates who had repeated a grade at secondary school were few and did less well than those who had passed regularly , "Le rendement de l'enseignement secondaire").

4.6. Drop-outs. After two or three years' absence form primary shcool children are liable to forget all they have learned and revert to illiteracy. However, there is a very high drop-out rate, particularly in the first grade of primary school.

A deliberate policy to attract pupils to attend the first three or four years of primary school should be conducted so that the drop-out rate might become insignificant. The very high cost of such a policy, the difficulties of which should not be underestimated, would be largely compensated for because of its long-term effects on the literacy standard of the population.

4.7. The rationalization of management. Examples of mismanagement are many and varied, e.g. lack of maintenance and deterioration of equipment too many or not enough administrative officers; too many or not enough service staff; bad distribution of subjects in daily time-tables; lack of strict discipline in medical and health supervision, resulting in increased absenteeism; lack of vocational guidance services; bad system of grading pupils, etc.

BY WAY OF CONCLUSION ...

It is certainly preferable to be rich and educated rather than poor and illiterate; it is obviously desirable that everyone should be able to receive a very long general education of high quality. However, the shortage of funds available and the extent of the needs both in education and other branches are such that we are always finding ourselves formulating the same selection list either implicitly or explicitly, i.e. to give a good quality education to a small number or a minimum education to a larger number. While selection can only be political. I have tried in this paper to put forward some suggestions. Education experts will easily find many arguments against these suggestions and the proposals to improve the efficiency of educational systems I have given above. Some of these proposals obviously have disadvantages, but advantages and disadvantages must be balanced. The practice of "all or nothing" in education is not nessarily the most profitable one.

PRODUCTIVITY AND THE TEACHER

by J.D. Chesswas

CONTENTS

Page

The purpose and function of the educational system IX - 1

The need for the teacher IX - 2

The teacher's work IX - 4

(a) What is expected of the teacher?

The teacher's work IX - 6

(b) What does the teacher actually do?

The teacher's skills IX - 7

(a) Levels of education and training

The teacher's skills IX - 8

(b) The use of assistants

The power of the teaching force IX - 8

1. The purpose of these notes is to point to some of the important questions relating to the teacher which must be considered when one is analysing the productivity of an educational system with a view to improving it, in the hope that they will stimulate ideas which will be of benefit to the seminar.

The purpose and function of the educational system

2. To get the teacher's task in its proper perspective, it is first necessary to spend a little time discussing the place of the organized educational system and its institutions in the total learning process. This process is continuous - man is always learning from his experience, at school, at home and in the community generally. One of the fundamental questions to be answered is the part that the organized educational system should play in that learning process. The major educational influences are the home and the school, with religious and community organizations playing an important part in some cases. How much of this work should the school be expected to do? How much can it do efficiently? - and, of course, how much of the nation's resources can be allocated to it? - a question which may place a limitation on its activities irrespective of what might be considered its desirable functions.

3. The considerations will give rise to more specific points which will affect the place and work of the teacher in the educational process. To what extent should the organized educational system train for specialized vocational activities? To what extent should it inculcate a social

and civic sense in its products? What responsibility should it have for spiritual and moral training? How much of its activities should be devoted to the development of the physical and cultural side of the lives of its subjects? How should any or all of these activities be shared with the home, the church, the community, or industry? Could or should the 'frills' of the educational process be reduced or cut out altogether so that limited resources available can be concentrated on, say, universal literacy, or the utilitarian purpose of training for the earning of a living and contribution to economic progress. If so, should provision be made for the broader aspects of education and by whom?

The need for the teacher

4. For many years educational thought has moved away from the concept of 'teaching' to that of 'learning', away from the 'delivery' of knowledge, ideas and principles by the teacher to the students, and more emphasis on the acquisition of such knowledge by the students through their own activities, experiences and reading. This has not meant that the teacher is becoming redundant: far from it; he now needs improved skills to enable him to stimulate and guide the students in the learning process, and ideally it would necessitate proportionately more teachers because of the emphasis on individual learning at the rate applicable to each student and a consequent need for more supervision of the individual by the teacher.

5. At the lower levels of education the idea of any form of lecturing, especially to a large group, is considered to be completely outdated and totally unsuitable for children of the age concerned. Again, at those levels supervision is considered essential - it is interesting that even with the use of television in education at these levels, the presence of a classroom teacher - and not simply a 'child-minder' - has been found to be necessary. At these levels of education stimulation, guidance and supervision for comparatively small groups are still necessary for good results from the learning process.

6. However, as we proceed higher in the educational system, it becomes more and more possible both to expect students to be able to undertake unsupervised reading and possibly other activities and to group them, for some purposes, in larger groups. There are, of course, still times when smaller groups, even individual teaching, are necessary, but it is suggested that the common practice, certainly in some developing countries, whereby the student: teacher ratio is comparatively high in the lowest grades of primary schools and gets progressively lower as one proceeds up the educational system could stand some investigation on educational grounds, quite apart from other considerations.

7. The question must be asked whether it is possible, at any level of education, to replace the teacher by mechanised education. From what has been said above about the lower levels of education, it would appear that it is impossible at that stage, but the possibility of mechanising at least

certain parts of the learning process for more mature students who can be relied upon to discipline themselves and study efficiently without constant human supervision could be considered. There are a number of cases in some parts of the world where this situation virtually exists already. The key to it is motivation and a mature, responsible attitude.

8. However, one question must be raised here. If the educational process includes moral and spiritual guidance and the formation of character, the question must be asked whether a machine can do this. The conclusion may be that the machine can do much, but that there are certain educational functions for which the human teacher cannot be replaced.

The teacher's work

(a) What is expected of the teacher?

9. The bare time-table of formal, and possibly not-so-formal, lessons, combined with the official school calendar for the year, does not normally give the complete picture of what a conscientious teacher is expected to do. There may be extra-curricular activities which are not shown on the time-table; there are hosts of administrative duties which are often distributed among the teaching staff; there are the activities connected with the welfare of students, and contact with parents; there is preparation of lessons and teaching rooms before the actual classroom occupations begin; there is the correction of students' work after they are finished and often of work which students have done out of the official hours on the time-table; there are examination duties which many teachers undertake as part of their work. At

the higher levels of education, many, if not most, of the teaching profession are engaged in research activities which may quite rightly take up the majority of their time, even at the lower levels, it is usually necessary and in the interests of educational efficiency for a teacher to read and study to improve his own knowledge and experience. During the official school holidays he will probably spend some time before the beginning of term and after it has closed engaged in meetings and administrative matters connected with his school. He may also take part in courses - either as a teacher or as a student - conferences, seminars, workshops, all designed for the purpose of making teachers better and more efficient.

10. It is not sufficient therefore to look at only the school time-table and calendar and count up the number of periods a week, possibly with the number of free periods a teacher may have; nor the number of days in the school year on which the school is open. It is necessary to investigate the total work of all kinds which is expected of a teacher and to assess that total against a reasonable work-load for a professional man of his standing. It might well be found that many teachers who, on the surface, appear to be underworked, turn out in fact to be carrying an excessive load of necessary tasks.

11. In such circumstances what can be done to improve the productivity of the teacher? This is where the considerations of the function of the educational system, discussed at the beginning of this paper, enter the issue. The question must be asked whether the share of the whole education process which is expected of the organized system is necessary, appropriate or reasonable.

This must be viewed in the whole situation, social, political and economic. Can, and should, the tasks of the educational system be changed or reduced so as to reorganize the teacher's work to enable him to have a more productive effect on the students in school or on more students? This might even give rise to the consideration of 'stripping' the content of the organized courses and reducing the time students spend at school so that teachers can deal with two or more groups of children. Such a suggestion is bound to give rise to opposition, but the situation must be weighed in the balance. In such a case it is a matter of whether the resources available, financial, physical and skilled human resources, should be spread over a large number of children with a 'thinner' education, or concentrated on fewer with a greater depth to their education. If it is to be thinner, will other educational influences provide the missing enrichment or must it be forgone? A difficult decision but one which must be faced by countries with limited resources.

12. At the same time it is worth examining the functions and activities of teachers to see if there are any that can be changed or dispensed with, thereby raising productivity. In the process something may be lost, but once more it is a matter of weighing the balance of gains against losses. If the country cannot afford both, a choice must be made.

(b) What does the teacher actually do?

13. However, it may be found in some cases that the reality is different from what can be expected from a conscientious teacher. The time-table lays down a set pattern of times to be devoted to various subjects, but is it

fulfilled? Are subjects taught as shown on the time-table? Are periods missed or perhaps shortened? Is the principal of the school a poor supervisor and is his staff slack as a result? What is the standard of punctuality, both of teachers and of students? What is the incidence of teacher absence? How often is a class left to its own devices? Do the teachers prepare their work conscientiously? Do they supervise and correct students' work? Do they do their share of supervision of extra-curricular activities? Do they do anything to improve themselves as teachers? Is there possibly loss of time due to organizational problems, e.g. the use of subject rooms and the loss of time between lessons as classes move from room to room?

14. The 'paper' situation must not necessarily be assumed to reflect the actual situation without some evidence. Efficiency and productivity could possibly be improved considerably simply by better organization, discipline and control of the human and physical resources which already exist, with little or no additional cost.

The teacher's skills

(a) Levels of education and training.

15. It is clearly necessary to have highly educated teachers for the highest levels of education; but what of the lower levels? A teacher must desirably have a 'cushion' of education and knowledge above the level at which he is teaching, but the greater this 'cushion' the more he will cost. It is worth investigating, however, whether there might be a lower limit to the educational background of a teacher, below which his skill, confidence and

flexibility are so poor that, even though he may cost much less than a teacher who has the education at or above the lower limit, his ability to induce the learning process in his students is so much worse than that of the better educated teacher that, in terms of productivity, his low salary is false economy. In addition, it may easily be a waste of resources to give him even the simplest of teaching aids because he would not know how to use them effectively; many a teaching aid in primary schools in developing countries gathers dust in a cupboard, never used because the teacher has neither the initiative, knowledge or skill to use it.

(b) The use of assistants.

16. Under such circumstances it might be more productive to confine the professional teaching force to a limited number of trained personnel who have at least the level of education which is considered the minimum desirable and give them assistants to carry out certain functions. The idea of an untrained assistant taking part in the teaching process is anathema to some professional teachers, but investigations of the detailed activities carried out by teachers have revealed many functions which could be delegated to lower educated and untrained - and therefore cheaper - assistants. Even the nose-wiping, chalkboard-cleaning, meal-supervising assistant could release the professional teacher to devote more time to the more appropriately professional duties, with the possibility that he can spread the benefit of them to more students.

The power of the teaching force

17. Whether such proposals could ever even be considered will depend to a

great extent on the opinion and influence of the teaching force as a body. As with all occupations, this force is made up of individuals with different approaches and attitudes. Some are conscientious and hard-working; others are lazy and 'clock-watchers'. Some are imaginative, forward-looking and prepared to experiment; others are conservative, reactionary, viewing innovations with suspicion and scepticism. The teaching force has its enthusiasts and its disillusioned, soured passed-overs. The teacher is the key factor in the educational process and on him depends to a great extent any improvements in efficiency and productivity which may be achieved.

18. Teachers' organizations vary in power, influence and interests. Some are solely interested in pay and conditions of service of their members; others spread their net wider and interest themselves in educational activities. To such organizations we may be able to appeal for co-operation in attempts to investigate and improve productivity of the educational system.

19. The power of the teaching force, organized or not, should not be underestimated or deliberately ignored, because in the end the opposition or inertia of teachers can confound the best laid plans, or their co-operation can make for success, and the initiative, imagination and ideas which exist amongst them can produce even richer plans which may have even greater success. Discussions for the improvement of productivity of an educational system should therefore include practising teachers, preferably from all sectors of the educational system from the very beginning.

LA RATIONALISATION ET LA NORMALISATION DES PROGRAMMES DE CONSTRUCTION DES ECOLES ET DES TECHNIQUES DE CONSTRUCTION

par R. Poignant

TABLE DES MATIERES

Pages

PREMIERE PARTIE X - 1

I. NATURE DES PROBLEMES A RESOUDRE ET DEFINITIONS X - 1

II. LA DETERMINATION DES "PROGRAMMES PEDAGOGIQUES" X - 1

III. LES DIVERSES CONCEPTIONS POSSIBLES DU "PROGRAMME TECHNIQUE" DE CONSTRUCTION X - 2

CONCLUSION X - 4

DEUXIEME PARTIE X - 5

INTRODUCTION X - 5

I. LES SOLUTIONS TECHNIQUES X - 5

II. LES PREALABLES ADMINISTRATIFS A LA RATIONALISATION DES TECHNIQUES DE CONSTRUCTION X - 6

CONCLUSION X - 7

ANNEXE X - 8

I. EXTERNAT X - 8

II. DEMI-PENSION X - 11

REMARQUES IMPORTANTES X - 12

PREMIERE PARTIE

LA RATIONALISATION ET LA NORMALISATION DES PROGRAMMES DE CONSTRUCTION DES ECOLES

I. NATURE DES PROBLEMES A RESOUDRE ET DEFINITIONS

1. Définition du "programme de construction" :

- c'est la définition précise par le maître de l'ouvrage de ce qu'il désire obtenir;
- concrètement, c'est un document remis à l'architecte qui énumère la liste des locaux (classes ordinaires, classes spécialisées, dortoirs, réfectoires, etc...) et leurs caractéristiques (dimensions, etc...). (Voir des exemples de programmes de construction de collèges d'enseignement général et de collèges d'enseignement technique industriel)

2. Nature des problèmes à résoudre :

a) Les difficultés à résoudre et les choix à faire sont de nature essentiellement pédagogique (rôle de l'administration de l'éducation nationale et au planificateur de l'éducation);

b) Deux phases doivent être distinguées :

- le "programme pédagogique" (fixation des effectifs à accueillir par type de formation);
- le "programme technique de construction", c'est-à-dire l'inventaire des locaux nécessaires (document remis à l'architecte).

II. LA DETERMINATION DES "PROGRAMMES PEDAGOGIQUES"

1. Il s'agit, en définitive, de fixer la "taille" de l'établissement.

L'idéal serait de normaliser, pour chaque degré d'enseignement, les "unités scolaires" à construire; en fait, il est impossible d'aboutir à une normalisation absolue car la taille des établissements est fonction de diverses variables; à savoir, principalement :

a) Les caractéristiques de la population à desservir :

- populations dispersées ou concentrées,
- possibilités de transport des élèves, etc...

b) Les impératifs pédagogiques propres à chaque degré de l'enseignement :

- possibilités de direction pédagogique (éviter les établissements trop grands);
- emploi total des professeurs spécialisés;

n - emploi total des locaux spécialisés (éviter les établissements trop petits).

2. La normalisation des "programmes pédagogiques" et la "carte scolaire" (cas de la France)

a) La carte scolaire des établissements du 1er degré

- écoles à une classe, 3 classes, 6 classes, 12 classes;
- choix entre les diverses solutions.

b) La carte scolaire des établissements du 2ème degré

- les "secteurs" scolaires;
- les "districts" scolaires :

Exemples : C.E.G. 400 élèves,
C.E.S. 600, 900, 1 200 élèves,
C.E.T. 216, 324, 432 élèves,
L.T. jusqu'à 1 272 élèves.

III. LES DIVERSES CONCEPTIONS POSSIBLES DU "PROGRAMME TECHNIQUE" DE CONSTRUCTION

Les effectifs à scolariser sont fixés. Que faut-il construire ?

1. Les éléments à prendre en compte :

Deux éléments essentiels :

a) Les horaires des élèves par matière :

- enseignement général (salles ordinaires);
- autres enseignements (salles spécialisées):
  - Histoire-géographie
  - Dessin
  - Musique
  - Sciences
  - Travail manuel
  - Gymnastique

Ce sont des données, en principe, fixées par les règlements.

Question : peuvent-elles être assouplies ? Cas des écoles primaires (mi-temps).

b) Les horaires d'utilisation des locaux :

- grande souplesse possible (30 à 50 ou 60 heures).

2. Examen détaillé du programme technique de construction d'un C.E.S. de 600 élèves (Annexe I)

- 17 classes (groupes de 35 élèves)
- Nombre de locaux

a) Enseignement général 8 grandes classes
2 petites classes (1/2 classes)

Total 9

b) Enseignements divers 8 salles

Total 17 salles

c) Une salle de permanence + un gymnase.

Conclusions à en tirer :

- identité de l'horaire des élèves et de l'horaire d'utilisation des locaux (environ 30 heures)[1];
- dans ces limites, pleine utilisation des locaux (85 à 90%) (sauf la salle de musique);
- pas d'appropriation d'une salle d'enseignement général par un groupe d'élèves (point capital).

3. Avantages et inconvénients d'une plus longue utilisation des locaux

a) Possibilités effectives d'utilisation des locaux (50% de plus);

b) Avantages : Accueil possible de 900 élèves, à condition de :

- Revoir le programme d'internat (
-) dans quelle proportion ?
- Revoir le programme de demi-pension (

c) Inconvénients :

- Pour les familles.
- D'ordre purement pédagogique (fatigue en fin de journée)
- Pour l'organisation du transport des élèves.

CONCLUSION

1. Cette solution est financièrement valable dans les grands centres (pas d'incidences sur le transport et l'internat).

2. Elle doit être étudiée de près si elle accroît le pourcentage d'internes.

---

[1] Dix demi-journées de trois heures.

DEUXIEME PARTIE

LA RATIONALISATION DES TECHNIQUES DE CONSTRUCTION

INTRODUCTION

La normalisation des "programmes pédagogiques" et la normalisation des "programmes techniques" de construction étant obtenues, le problème à résoudre consiste alors à réaliser les locaux dans les meilleures conditions :

- de prix
- de rapidité

c'est-à-dire, à rationaliser davantage les techniques de construction.

I. LES SOLUTIONS TECHNIQUES

1. La normalisation des locaux

a) La coordination dimensionnelle

- système français de la "trame élémentaire" de 1m 75 (toutes les dimensions sont des multiples ou sous-multiples de 1m 75).

b) Les schémas types

A partir d'une trame unique peuvent être établis des plans précis des différentes cellules de travail[1] qui constituent une école (salles ordinaires, salles spécialisées de tous genres).

L'intérêt des schémas-types est considérable :

- pédagogique (c'est une réflexion méthodique sur la fonctionnalité des locaux d'enseignement);
- technique (gains de temps, de surface, etc...)
- financier : les schémas normalisés dont les composantes sont connues permettent de fixer des prix-plafonds pour les différents types d'opérations et d'établir une discipline financière rigide.

---

[1] Catalogue de schémas types publié par le Ministère de l'éducation nationale (I. P. N.).

c) Les projets-types

C'est l'extension des schémas-types à l'ensemble d'un établissement. Le rôle de l'architecte devient alors très réduit (exemples : écoles primaires prototypes, C.E.S. industrialisés, etc...).

2. La préfabrication et l'industrialisation de la construction

But : Remplacer les procédés artisanaux de construction par les techniques industrielles.

a) La préfabrication partielle :

- d'éléments isolés standardisés qui peuvent être incorporés dans toutes les constructions : panneaux, menuiseries, murs-rideaux, etc...);
- des éléments du gros-oeuvre (elle peut être obtenue, soit par une adaptation de la construction traditionnelle, soit par l'utilisation de structures métalliques).

b) La préfabrication totale (construction industrialisée)

- le projet-type est exécuté en série comme les automobiles.

Conclusion :

Le recours à ces techniques nouvelles est subordonné à la normalisation des locaux (programmes-types intangibles, "trame" unique, schémas-types, etc...).

II. LES PREALABLES ADMINISTRATIFS A LA RATIONALISATION DES TECHNIQUES DE CONSTRUCTION

1. L'existence de programmes-types de construction

- exemple d'un C.E.S. de 600 élèves (Annexe I).

2. La "garantie de série"

C'est la garantie donnée aux entreprises chargées de l'exécution des travaux de pouvoir les répéter dans l'espace et dans le temps (continuité des travaux).

a) Intérêt de la répétition :

- productivité du travail accrue par les habitudes prises par la main-d'oeuvre;
- possibilité pour les entreprises d'investir en vue de la préfabrication (amortissement rendu possible).

b) Difficultés juridiques :

- l'adjudication;
- la règle de l'annualité budgétaire (impossibilité de garantir des travaux sur des programmes hors budget - intérêt des lois de programmes pluri-annuelles.

c) Les solutions possibles :

- les "commandes groupées" (marchés concernant plusieurs écoles);
- les marchés par "tranches optionnelles";
- les "marchés pluri-annuels" (garantie de construire un volume régulier de classes chaque année); cette solution paraît possible avec les conventions du F.A.C. et du F.E.D.

CONCLUSION

Comment appliquer ces principes et ces modalités dans les pays en voie de développement :

1. éléments dont l'application directe ne pose pas de difficultés - lesquels ? (à discuter);

2. éléments dont l'application est plus difficile;

3. nécessité de la création d'un service technique des constructions scolaires. Dans quel cadre administratif ?

ANNEXE

PROGRAMME TYPE D'UN COLLEGE D'ENSEIGNEMENT SECONDAIRE (POUR 600 ELEVES)

I. EXTERNAT

NATURE DES LOCAUX	LOCAUX NECESSAIRES			OBSERVATIONS
	Nbre	Caractéristiques de chaque unité		
		En surface	En trames	
A. SALLES D'ENSEIGNEMENT GENERAL				
Salle de cours	8	60m2 env.	4 x 5	1. Dépôt-Bibliothèque-Documentations : ce local est commun à la salle d'Histoire et Géographie et à la salle de Musique.
Salle de cours	2	36m2 -	4 x 3	
PERMANENCE	1	72m2 -	4 x 6	
LOCAL POUR ACTIVITES COOPERA.	1	24m2 -		
B. SALLES SPECIALISEES				SALLES DE PHYSIQUE ET TECHNOLOGIE, D'ENSEIGNEMENT PRATIQUE Nos. 1,2 & 3 a) à chacune de ces salles est associé un dépôt, les deux locaux communiquant entre eux par une porte.
Histoire et géographie	1	60m2 -	4 x 5	
(1) Dépôt biblioth. document	1	36m2 -	4 x 3	
MUSIQUE (salle insonorisée)	1	60m2 -	4 x 5	b) Ces diverses salles seront rapprochées dans leur implantation et, dans toute la mesure du possible, groupées; si l'ensemble devait être scindé, il conviendrait de placer la salle de PHYSIQUE et de TECHNOLOGIE près de la salle de SCIENCES.
DESSIN (salle bien éclairée avec poste d'eau)	1	72m2 -	4 x 6	
Dépôt pour modèles	1	74m2 -	4 x 2	
SCIENCES	2	72m2 -	4 x 6	
Collections-laverie-prod.	1	49m2 -	4 x 4	
PHYSIQUE ET TECHNOLOGIE	1	96m2 -	4 x 8	
Dépôt	1	24m2 -	4 x 2	c) La salle d'ENSEIGNEMENT PRATIQUE No. 1 sera insonorisée et obligatoirement placée au rez-de-chaussée
Salle d'enseignement prat. No. 1	1	84m2 -	4 x 7	
Dépôt	1	24m2 -	4 x 2	
Salle d'enseignement prat. No. 2	1	72m2 -	4 x 6	d) Pour la réalisation de ces salles on se référera aux schémas-types et notices techniques annexés dont les dispositions sont impératives.
Dépôt	1	24m2 -	4 x 2	
Salle d'enseignement prat. No. 3	1	72m2 -	4 x 6	
Dépôt	1	24m2 -	4 x 2	
C. LOCAUX MEDICAUX ET SOCIAUX				LOCAUX MEDICAUX ET SOCIAUX :
Salle de mensurations	1	30m2 -		Ces locaux devront se trouver au voisinage de la salle de permanence.
Cabines de déshabillage	3	1,75m2-		
Bureau du Médecin et de l' sociale	1	18m2 -		
Sanitaire	1	6m2 -		
Salle de soins et de repos (avec 2 boxes)	1	24m2 -		

I. EXTERNAT (suite)

NATURE DES LOCAUX	LOCAUX NECESSAIRES			OBSERVATIONS
	Nbre	Caractéristiques de chaque unité		
		En surface	En trames	

D. EQUIPEMENT SANITAIRE (Cet équipement tient compte des éléments de secours éventuellement nécessaires aux étages).

Garçons	:	W.C. (cuvette non contact)	8
		Urinoirs	15
		Lavabos	15 robinets
Filles	:	W.C. (cuvette non contact)	15
		Lavabos	15 robinets

N.B. Prévoir également une prise d'eau froide et un placard de rangement de matériel d'entretien par bloc d'équipement sanitaire (rez-de-chaussée et, éventuellement aux étages (secours)).

I. EXTERNAT (suite)

NATURE DES LOCAUX	LOCAUX NECESSAIRES		OBSERVATIONS
	Nbre	Surface	
E. LOCAUX ANNEXES			
Salle des professeurs	1	49m2 env.	
Vestiaire-sanitaire des prof.	1	6m2 -	
F. ADMINISTRATION			
Bureau du Directeur	1	18m2 -	
Bureau du Sous-Directeur	1	18m2 -	
Bureau du Secrétariat de Direction	1	24m2 -	
Bureau du Gestionnaire et Secrétaire	1	24m2 -	
Bureau pour l'Orientation	1	12m2 -	
Local de duplication et archives	1	6m2 -	
Vestiaire-sanitaire	1	6m2 -	
Loge du concierge	1	12m2 -	
Salle d'attente-parloir	1	18m2 -	
G. APPARTEMENTS DE FONCTION			
Du Directeur	1	100m2 -	
Du Sous-Directeur	1	85m2 -	
Du Gestionnaire	1	85m2 -	
Du Concierge	1	57m2	
D'agent	1	57m2 -	
H. LOCAUX ET EQUIPEMENTS DIVERS			
Réserve-dépôt (pour mobilier et matériel)	1	60m2 -	
Atelier de factotum	1	18m2 -	
GARAGE pour vélos et vélomoteurs	1		Sur la base de 1m2 environ pour trois élèves, l'effectif des externes et celui des demi-pensionnaires devant, seuls, être retenus à cet égard. Se référer au programme pédagogique de l'opération en cause.
PARKING pour véhicules automobiles	1	pour 15 autos	
ABRI-DETENTE-JEUX (préaux)	1	de 220m2 env.	
TELEPHONE-SONNERIE-HORLOGE	Installation normalisée conformément aux dispositions de la circulaire du 11 avril 1960.		
AIRES DE RECREATION	1 700m2 env.		

II. DEMI-PENSION

NATURE DES LOCAUX ET EQUIPEMENTS NECESSAIRES

I.. RAPPEL DE L'EFFECTIF DES RATIONNAIRES

Elèves	450
Maîtres	10
Agents	10
Total :	470

J. LOCAUX ET EQUIPEMENTS NECESSAIRES

a) CUISINE — Comportant annexes, réserves correspondantes et sanitaires des agents .... 1 cuisine de type B (se référer au schéma-type annexé au présent programme)

b) SALLES-A-MANGER 1/

pour les élèves	225 places
pour les maîtres	10 places
pour les agents	10 places

c) LAVABOS-VESTIAIRES-SANITAIRES 2/

Lavabos	70 robinets
Vestiaires	225 patères
W.C. (de secours)	2

d) LINGERIE (pour le linge de maison)

1 local de 6m2 environ.

1/ Sur la base de 0,90m2 environ par place prévue dans les salles-à-manger.

2/ Sur la base de 0,20m2 environ par place prévue dans les salles-à-manger d'élèves.

REMARQUES IMPORTANTES

I. ETUDE DU PROJET

Avant toute étude, l'architecte chargé de l'opération aura intérêt à consulter la documentation publiée, sur les constructions scolaires, par le Service d'édition et de vente des publications de l'éducation nationale, 13, rue du Four à Paris 6ème.

Il gardera le contact avec la Direction de l'équipement scolaire, universitaire et sportif, l'Inspection générale chargée de l'organisation scolaire dans le ressort de l'Académie intéressée, le service constructeur départemental et les autorités universitaires locales (Recteur, Inspecteur d'Académie).

II. SALLES SPECIALISEES

Pour l'identification et la réalisation des locaux spécialisés ci-après :

- Salle de sciences
- Salle de physique et technique
- Salles d'enseignement pratique Nos. 1, 2 et 3
- Cuisine

On se réfèrera aux schémas-types et notices techniques annexés à la présente nomenclature, les caractéristiques dimensionnelles et techniques définies étant impératives.

III. SURFACE DES LOCAUX - CIRCULATIONS-ESCALIERS-DEGAGEMENTS...

Aux surfaces (qui ne tiennent pas compte des hypothèses de construction) indiquées dans la colonne "ad hoc", s'ajoutent celles des circulations, escaliers, dégagements, halls et divers pour lesquelles les hypothèses suivantes peuvent, en règle générale, être faites :

- Externat : 25% environ, des surfaces des locaux d'externat
- Internat : 20% environ, des surfaces des locaux d'internat

IV. TRAME

Les locaux seront toujours dessinés suivant une trame.

Cette trame sera, en général, celle de 1,75 m couramment utilisée ; elle pourra être, cependant, de 1,80 m si les dispositions constructives prévues nécessitent l'adoption de cette dimension pour pouvoir utiliser au mieux des éléments de construction régis par la norme N.F.P. - 01 - 101.

V. EQUIPEMENT SPORTIF

Pour l'étude et la définition du programme d'installation d'éducation physique et sportive on se conformera aux dispositions de la circulaire No. 65-13 du 3 février 1965 - cf. B.O.E.N. No. 9 du 4 mars 1965.

EDUCATIONAL ARCHITECTURE v. EDUCATIONAL CHANGE

by J. Beynon

CONTENTS

Pages

1. Initial cost XI - 2

2. Shortage of Professionals XI - 2

3. Official Class Size XI - 3

4. Climate XI - 3

5. Esthetics XI - 3

Educational planning may be the most promising avenue for promoting educational change in developing countries, but educational architecture will be one of its most formidable roadblocks.

The fundamental reason for this obstruction is financial. The effect that capital investment in buildings has on education is not always evident since construction constitutes but 5 to 15 % of the annual education budget, but, viewed cumulatively, the replacement cost for the total educational plant could be as much as 200 %[1] of the total annual education budget. Looked at another way, the cost of a new classroom is generally 2 to 3 times the annual salary of the teacher and a thorough remodeling might equal her salary for a semester[2].

Consequently, far reaching plans to make even relatively minor changes in existing buildings are financially out of the question for countries where expansion of education is necessarily a top priority. In view of this, it is obvious that educational reform has one very clear-cut parameter - it has to make do with already available facilities.

This would be an acceptable restraint provided that this outsized capital investment had been put into facilities which were planned around

---

1/ Assuming that buildings have a 50 year useful life, that 10% of the educational budget is being spent on school construction, and an annual budget increase of 5% - both for the total budget and for buildings - the total replacement cost of all schools in any given year would be 191% of the total budget for education during that year.

2/ A change that would involve varying the sizes of classrooms would cost on the order of 10 to 20% of the total cost of the building.

educational processes which were to be used for the life of the building. But a look at the variety - even the disparity - of educational policies and practices in use in the world today implies that education takes many forms and that evolution, improvement and change are parts of its nature. This casts some doubt on whether present practices of any country are sufficiently fixed to justify permanent definition in reinforced concrete.

A short analysis of the major factors influencing school designs in developing countries may be a help both to highlight major problems which have to be faced and to illustrate the dangers inherent in present building design practices.

1. Initial cost - the hurt of having to spend money on such "non-educational" items as buildings, creates budgetary policies and building codes which restrict the buildings' role to that of providing shelter without amenity; raw space without regard for the processes going on within.
2. Shortage of Professionals - the lack of competent national architects, engineers, quantity surveyors, and foremen coupled with the high cost of expatriate professionals means that individual buildings cannot be given proper professional attention. This necessitates the costly misuse of standard plans. While the thesis that standardisation yields savings has some basis in an industrialized economy, the converse is often true in a developing country. In the case of schools, regional or national standardization leads to blind conformity to drawings and thus prevents advantage from being taken of particular local conditions which could effect considerable construction savings.

3. Official Class Size - Buildings are planned with "Standard" areas per class and per child which are based on very carefully worked out studies of the exact minimum areas required by students and teachers. Often overlooked are :

- the actual size of classes rarely matches the "official" size and then only by virtue of a turn of statistical fate;
- the number of students available for each grade is practically never the same and often changes drastically over the course of a year;
- the Minister can change the official class size with the stroke of a pen; changing the size of even one classroom may be more difficult to accomplish.

4. Climate - once the required area per class is decided, the factors of sun and wind often determine the final shape and orientation of the building. The long slender buildings scattered over a site which result from letting climate dominate design are only marginally affected by the advice of the educator.

5. Esthetics - too often designs are generated by ideas borrowed from foreign architectural publications rather than by a penetrating analysis of actual conditions. The not uncommon result is inappropriate and uncomfortable buildings.

The problem in the opening paragraph must now be asked - are educators forming their educational programmes after careful analysis of the educational facts or are they being dictated to by a looming capital investment based on educational ideas that are one, two, or even three generations old ? In short, can an educational metamorphosis take place in a well established (and solidly built) educational system even if everyone agrees it should ?

The key problem for the planner and the architect seems to be that of reconciling the short-term nature of educational plans and the long-term commitment that is made when a building is put up. Keeping in mind that buildings last for 50 to 75 or even 100 years, the following architectural guidelines are proposed :

a) Buildings should be conceived and designed as large scale teaching aids. If they can make a contribution to education by helping the teachers to be efficient and by passing ideas and values to the students, then they cannot be regarded as parasites which are robbing illiterate children of teachers as they are now considered in some countries.

b) Budgeting for buildings should be based on the life of the building, not initial cost only, since the financial problem is one of value for money over a long range.

c) Internal spaces should be flexible, and site planning should allow for expansion of buildings and conversion to non-school use.

d) Educational changes and technological advance should be anticipated by insuring that each school is built (or can inexpensively be remodeled) to accomodate individualized programmed instruction, larger student groups as well as smaller student groups, educational television and audio-visual aids.

e) Educational considerations need to top the list of any building's objectives : lighting and ventilation should be servants of the educational process, not its master. Climate factors should be given adequate attention but should not dominate the design.

These not very startling guidelines are suggested only to help focus on the most fundamental problems for school design in the developing countries. If these are clearly recognized and faithfully solved, the quality and appearance of the buildings will be raised as well as the utility - and without seriously changing long-range costs.

One conclusion that can be drawn from the above observations and guidelines is that good planning alone is not enough to guarantee the establishment of a satisfactory educational plant. Over the long range construction of inappropriate buildings based on sound planning can be as detrimental to rational educational expansion as excellent buildings built without a plan.

However, if naive or uninformed architects are to be prevented from building paralysis into well founded educational plans, they badly need more visionary instructions. The architect's job, after all, is that of solving problems identified by his educational counterpart. From viewing the buildings now in existence, it would seem that the developing countries' educators have been demanding too little from their architects.

Now, as the developing nations cross the threshold of accelerated expansion of their educational facilities, it is crucial that educationists look 50 years ahead (as well as at the contemporary educational development plan) when stating facilities needed. If this is not done soon, there is risk that the sizable educational financing programmes, which are being heralded as e major force behind the drive for economic development, rapidly will create a massive inertia against future educational reform. Certainly, if education can help to promote economic development, as is now generally agreed, then buildings which resist the introduction of more efficient and improved educational techniques are not only holding back educational reform, they are retarding economic development as well.

LIST OF PARTICIPANTS

LIST OF PARTICIPANTS

I. UNESCO REGIONAL CENTRES

Professors of Educational Planning (Economics)

M. BODART,
Regional Group for Educational Planning and Administration in Africa,
DAKAR, Senegal

F. de ESCONDRILLAS,
Educational Planning Section,
Latin American Institute for Economic and Social Planning,
SANTIAGO, Chile

J.P. GERN,
Arab States Centre for Educational Planning Administration,
BEIRUT, Lebanon

C.B. PADMANABHAN,
Asian Institute of Educational Planning and Administration,
NEW DELHI, India

Unesco Experts

W.B. DROS,
Asian Institute for Educational Planning and Administration,
NEW DELHI, India

PERNAU-LLIMOS,
Asian Institute for Educational Planning and Administration,
NEW DELHI, India

II. UNESCO HEADQUARTERS

Department of Planning and Financing of Education

R. DIEZ-HOCHLEITNER, Director

Representatives from the office of economic analysis

J. AUERHAN
M. BOREH

Representative from the Department of Planning and Financing of Education - Educational building section

J. BEYNON

III. OTHER UNITED NATIONS ORGANIZATIONS

M.V. BHATAWDEKAR, Professor
Asian Institute for Economic Development and Planning,
BANGKOK, Thailand

K.F. WALKER, Professor
International Institute of Labour Studies,
GENEVA, Switzerland

IV. REPRESENTATIVES FROM INSTITUTIONS AND UNIVERSITIES

M. BLAUG, Head of Unit
Research Unit in the Economics of Education,
University of London Institute of Education,
LONDON, United Kingdom

T.A.B. CORLEY,
Economics Department,
Reading University,
READING, United Kingdom

I. DEBLE,
Institute for the Study of Economic and Social Development,
PARIS, France

J. DELCOURT, Maître de Conférence
Catholic University of Louvain,
LOUVAIN, Belgium

J. CORNEHLS, Professor
Economic Department,
State University of New York,
ALBANY, N.Y. United States

R. DELPRAT, Professor
International Training and Research Centre for Development,
PARIS, France

J.M. FAVRET,
Ministry of Education,
Directorate of Co-operation,
PARIS, France

J. HOLLAND, Professor
The Ontario Institute for Studies in Education,
TORONTO, Canada

R. JOLLY,
The Institute of Development Studies,
University of Sussex,
BRIGHTON, United Kingdom

Representatives from Institutions and Universities (cont'd)

P. LEVASSEUR, Consultant
Organization for Economic Co-operation and Development,
PARIS, France

LE THANH KNOI, Professor
Institute for the Study of Economic and Social Development,
PARIS, France

M. GUENANCIA,
International Centre for Pedagogical Studies,
SEVRES, France

NGUYEN HUU CHAU, Professor
Institute for the Study of Economic and Social Development,
PARIS, France

V.G. ONUSHKIN, Professor
University of Leningrad,
LENINGRAD, USSR

W. PLATT, Director
Stanford Research Institute,
STANFORD, United States

POLIC VLADIMIRA,
Haute Ecole Industrielle-Pédagogique,
RIJEKA, Yugoslavia

V. TRIVELLATO,
Institute of Statistics,
PADOVA, Italy

S.A. SHUMOVSKY, Head of the Methodological Department,
Ministry of Higher and Secondary Specialized Education,
MOSCOW, USSR

F. WALZ,
Institute for Applied Economics,
University of Basle,
BASLE, Switzerland

H.P. WIDMAIER, Professor
Institute for Applied Economics,
University of Basle,
BASLE, Switzerland

M. WOODHALL,
Research Unit in the Economics of Education,
University of London Institute of Education,
LONDON, United Kingdom

V. IIEP STAFF MEMBERS

Philip H. COOMBS, Director of IIEP

R. POIGNANT

R.F. LYONS

J.D. CHESSWAS

TA NGOC CHAU

J. HALLAK, in charge of the Seminar